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UNITED STATES NAVY

Guide to Programs

Fiscal Year 1996

ADVANCE COPY

Contents

FOREWORD 1

INFORMATION, ELECTRONICS, AND SURVEILLANCE SCIENCE AND TECHNOLOGY DEPARTMENT 3
- Electronics Division 3
- Mathematical, Computer, and Information Sciences Division 5
- Surveillance, Communications, and Electronic Combat Division 7

OCEAN, ATMOSPHERE, AND SPACE SCIENCE AND TECHNOLOGY DEPARTMENT 9
- Modeling and Prediction Division 9
- Sensing and Systems Division 11

ENGINEERING, MATERIALS, AND PHYSICAL SCIENCE AND TECHNOLOGY DEPARTMENT 15
- Materials Science and Technology Division 15
- Mechanics and Energy Conversion Science and Technology Division 18
- Physical Sciences Science and Technology Division 19
- Ship Structures and Systems Science and Technology Division 21

PERSONNEL OPTIMIZATION AND BIOMOLECULAR SCIENCE AND TECHNOLOGY DEPARTMENT 24
- Biological and Biomedical Science and Technology Division 24
- Cognitive and Neural Science and Technology Division 28

SPECIAL PROGRAMS DEPARTMENT 32
- Strike Technology Division 32
- Corporate Programs Division 33

INDUSTRIAL PROGRAMS DEPARTMENT 47
- Manufacturing Science and Technology Division 47
- Industrial Outreach Division 49

CONTRACT AND GRANT AWARDS 52

HOW TO SUBMIT A PROPOSAL 54

GENERAL GRANT TERMS AND CONDITIONS 63

UNIVERSITY BUSINESS AFFAIRS 68

OFFICE OF SMALL BUSINESS 70

INDEX 71

FOREWORD

The Department of the Navy has integrated its research programs with exploratory and advanced technology development into a single Science and Technology (S&T) Program. This integrated S&T Program is planned and managed by the Office of Naval Research (ONR), and executed by performers in industry, universities, government and private laboratories. The Navy's goal is to manage its entire S&T process, from earliest scientific concepts to demonstration of prototypes, under one command dedicated to providing the capabilities naval forces will rely on for future warfighting superiority. ONR's mission is to maintain a close relationship with the international research and development community to support long-range research, foster discovery, nurture future generations of researchers, produce new technologies that meet known naval requirements, and provide order-of-magnitude innovations in fields relevant to the future Navy and Marine Corps. The fiscal year 1996 budget for ONR's S&T programs is over a billion dollars.

ONR, with headquarters in Arlington, Virginia, reports to the Secretary of the Navy through the Assistant Secretary of the Navy for Research, Development and Acquisition. It executes its mission in six technical departments, its Naval Research Laboratory (NRL), and field offices in London and Tokyo. ONR has its own organic support components, including comptroller, contracting, legal and administration, enabling it to tailor these services to the particular needs of S&T.

ONR places the authority for project selection in its cadre of 130 Program Officers, who are active scientists and engineers in their fields. Program Officers are selected for their technical qualifications and stature, as well as demonstrated maturity and ability to execute world-class programs in their fields. They are required to remain current in their disciplines, and are given time to pursue their own research and publication. Within general guidance, and subject to frequent review, Program Officers have broad authority to develop integrated research and development programs, and select projects and performers on the basis of technical merit and relevance to the Navy's interests. Program Officers are encouraged to take risks, pursue innovative ideas, and maintain long-term relationships with investigators, giving ONR an invaluable ability to apply relatively small investments early in the conceptual stages of a project, with great influence on the focus of the work. ONR does not require peer review to select individual projects, although it always includes peer panels when setting broad planning goals and assessing ongoing or completed programs.

Program Officers normally seek to invest in "niches" where small infusions of Navy money have maximum impact on a large area (like engineering of complex systems in the computer sciences), or where the Navy has a unique interest (like ocean acoustics). Programs are heavily leveraged with other Federal and private programs.

S&T programs are integrated both vertically (research through development) and horizontally (across departments) to provide synergy and transition routes for successful ideas. ONR's investment strategy balances many factors, including long-range vision with responsiveness to naval requirements; close ties to Fleet and acquisition customers with independence for risk-taking; selection of best performers with support for essential corporate facilities; maintenance of a broad program with critical mass in key areas; and direct funding with leveraging other agency funds.

In the basic research component of its S&T program, ONR maintains a historical funding balance among performers of about 50 percent to universities, 35 percent in government labs and 15 percent in industry. It seeks an investment balance of about 60 percent in evolutionary research, 15 percent in high-risk efforts, and 25 percent in high-priority areas through its Accelerated Capabilities Initiatives (ACIs). ACIs are areas with exceptional potential for technical payoff and value to future naval capabilities. They are backed by multi-year commitments of research and development funds at levels much larger than a typical project, and are aimed toward providing clearly anticipated naval capabilities. ONR's recent research investments have been especially focused in ocean sciences, advanced materials, information sciences, and a broad sustaining program in other disciplines of potential naval value.

The exploratory development effort of the S&T program ensures the availability of technology needed for identified systems development and product improvements. Exploratory development also advances the state-of-the-art in technologies that enable warfighting capabilities needed across the full spectrum of potential naval conflicts; and establishes a technology base for revolutionary new military capabilities. Exploratory development primarily sponsors applied research and development in industry and government labs, with approximately 7 percent of funds going to universities.

Advanced technology development demonstrates how new technologies can enhance military capabilities. To accomplish these demonstrations, funding balance shifts, with 65 percent going to industry, 30 percent to government labs, and 5 percent to universities. The program encompasses three thrusts: core programs—which develop and demonstrate many enabling technologies focused on naval needs and joint needs of the Department of Defense (DoD); advanced technology demonstrations—which show the technical feasibility of the most important emerging technologies, and advanced concept technology demonstrations—which show how technologies will impact military capability.

In addition to sponsoring science and technology projects, ONR strives to maintain the pipeline of future scientists and engineers. Education programs range from high school apprenticeships to faculty exchanges, including ONR's award-winning Graduate Fellowships Program and Historically Black Colleges and Universities Program

INFORMATION, ELECTRONICS, AND SURVEILLANCE SCIENCE AND TECHNOLOGY DEPARTMENT

This department's three divisions support science and technology programs in electronics; mathematical, computer, and information sciences; and surveillance, communications, and electronic combat. Sponsored programs focus on experimental and theoretical research and technology in these areas with emphasis on mid- and long-term applications. The research programs range from fundamental investigations into mathematical foundations for models, computability, and processes to solid state physics important to electronic devices to image and signal analysis. The technology programs seek to exploit the results of research opportunities to enhance surveillance capabilities, communications, command and control, new concepts for electronic devices, application of information sciences to complex problems including human-computer interaction, and electronic warfare

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Electronics Division

Projects within this division cover all areas of electronics of potential value to the Department of the Navy, including the growth of electronic materials, understanding of surfaces and interfaces, semiconductor material theory, microelectronics, nanoscale electronic devices, nanolithography, novel electronic device concepts, memory, high power radio frequency components, vacuum electronics, high-temperature superconductor electronics, optoelectronics, solid-state lasers and light emitters, multiband infrared and ultraviolet sensors, and innovative electronic circuits

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ELECTRONIC MATERIALS

This program develops the fundamental theory necessary for understanding the growth of a variety of solid-state electronic materials, including IV, III-V, and II-VI materials. Approaches include *ab initio* first principles calculations, functional density theory, Monte Carlo simulations, and molecular dynamic simulations.

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SURFACES AND INTERFACES

This program investigates the formation of surfaces and interfaces in solid state electronic materials at the atomic level as well as the growth and characterization of these materials. It is also engaged in developing techniques for nanolithography by means of proximal probe and scanning tunneling microscopy techniques (STM) that achieve nanometer line widths.

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ELECTRONIC AND ELECTRO-OPTICAL MATERIALS

This program develops underlying thin-film semiconductor growth and processing technology associated with the development of advanced infrared focal plane array, microelectronics, and radio frequency solid state devices. Processing materials such as lithographic materials, ferrites, and precursors to organic metal vapor phase epitaxy growth and processing are developed in this program.

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SEMICONDUCTOR DEVICES

This program investigates electronic properties of wide bandgap and silicon-based semiconductors and novel devices. The program is focused on high-power switching devices and microwave devices for broad band radar applications and power control applications.

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NANOSCALE ELECTRONICS

The objective of this program is to study the electronic properties of solid state materials and develop ultrasmall devices for microelectronic applications. Devices include quantum wells, resonant tunneling devices, single electron transistors, and spin transistors.

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RF SOLID STATE DEVICES

The objective of this program is to develop ultrahigh frequency, L-band, and radio frequency solid-state microwave power devices for use in communication systems and phase-array radars. Approaches include broadband, high power, high efficiency, and low noise devices, adaptive transmit/receive modules, microwave integrated circuits, high-power field effect transmitter devices, GaAs metal Schottky field effect transistors, and heterojunction bipolar transistor millimeter wave integrated circuits.

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VACUUM ELECTRONICS

The objective of this program is to develop high-power millimeter wave (MMW) vacuum electronic amplifiers having enhanced gain, bandwidth, and efficiency. The approach is to explore device concepts for generation and amplification of MMW at low voltages and low magnetic fields using both slow and fast wave electron beam interaction mechanisms.

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SUPERCONDUCTING ELECTRONICS

This program's objective is to understand the physics of high-temperature superconductivity and to develop electronic devices using high temperature-critical materials. The program is focused on understanding the interfaces of superconductors with metals and semiconductors, as well as developing integrated electronic devices for high speed analog-to-digital and other electronic applications.

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OPTOELECTRONICS

This program focuses on developing optoelectronics for high-speed communications and signal processing. Approaches include the investigation of widebandgap II-VI and III-V materials for light emitters in the blue spectrum, as well as new thallium-based materials for infrared detectors. This program also focuses on the development of optoelectronic integrated circuits for on-chip interconnections.

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ELECTRO-OPTICS TECHNOLOGY

This program develops advanced infrared focal plane array (FPA) technology for sensor and fiber optic technology for electronic warfare and radar systems. Specific approaches include demonstration of detector structures for dual color FPA's, large 500x500 FPA's, integration of readout electronics on the same chip, and fiber optics for infrared laser threat warning systems.

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MICROELECTRONICS

This program focuses on analog and digital very large-scale integration (VLSI), radiation-hardened electronics, high speed analog-to-digital, and advanced microelectronics. Special purpose architectures including word-wide refresherless memories and chip-to-chip optical interconnection are designed and optimized. Program also includes the development of SiGe, SiGeC, SOI, and ultrathin silicon technology for high-speed, low-power applications.

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IONOSPHERE MODIFICATION

Program projects attempt to stimulate the ionosphere using high-power microwave radiation for the purpose of low frequency communications. Approaches include the development of high power microwave amplifiers and microwave power stations in the high latitudes and the measurement of conduction currents in the ionosphere.

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JOINT SERVICES ELECTRONICS PROGRAM (JSEP)

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Mathematical, Computer, and Information Sciences Division

This division supports investigations in the following areas of computational and information science: applied analysis, numerical analysis, probability, mathematical optimization, discrete mathematics, formal synthesis and verification of software, real-time dependable computing, superscalar compilers, visualization and virtual reality, software engineering processes, artificially intelligent systems and decision aids, machine vision and robotics, command and control, simulation, and parallel algorithms.

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APPLIED ANALYSIS

This program develops and exploits methods in modern and classical mathematical analysis, with emphasis on mathematical models of physical phenomena. Naval interest in waves and flows motivates research in convection-diffusion with emphasis in the areas of shock capturing, inertial manifolds, lobe dynamics, and control-of-fluids.

Acoustics, electromagnetics, modeling the ocean bottom and the ocean medium, and nondestructive evaluation motivate research in inverse scattering and mathematical inverse theory.

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NUMERICAL ANALYSIS

This program supports research on the numerical solution of partial differential equations. Areas of interest include the problems of engineering design, acoustic propagation, geophysical fluid mechanics, and electromagnetic scattering. Emphasis is placed on developing methods to estimate, control, and reduce computational error, and on the analysis of error induced by mathematical approximations, such as dimensional reduction, and by data errors.

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PROBABILITY AND STATISTICS

This program focuses on probabilistic analysis and statistical inference for random fields and spatial processes, which model the temporal and spatial evolution of physical phenomena with particular emphasis on oceanographic applications. Stochastic geometry and geometric probability in conjunction with image analysis and the modeling of shape are also of interest. Several efforts are also supported in the areas of point and line processes in the plane, modeling, prediction, and control of extremes for nonlinear structures under stochastic excitation and stochastic models for the neural sciences.

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DISCRETE MATHEMATICS

This program develops areas of discrete mathematics that apply to engineering and information sciences. These include specific structural parameters and invariants for combinatorial configurations such as graphs, networks, sequences, and partially ordered sets. The use of discrete structures for modeling, consensus formation, and classification are of particular interest.

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SOFTWARE

This program is developing the foundations for the verifiably correct design and construction of complex software systems. Research is supported in linear logic and related proof systems, software testing, formal algorithm derivation, virtual environments, formal proof of correctness, and software system re-engineering, among other areas.

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COMPUTER SYSTEMS AND TECHNOLOGY

Program projects aim to help us understand how to use novel computational approaches such as massive parallelism and superscalar architecture in the context of highly dependable real-time systems. Research is pursued in superscalar compilers, distributed and trusted operating systems, fault-tolerant multiprocessors, real-time systems, and high-performance computing.

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SCIENTIFIC VISUALIZATION

This program develops novel approaches to the display and portrayal of scientific information. Its focus is on voxel graphics and virtual environments.

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ARTIFICIAL INTELLIGENCE

This program seeks to understand how computers can solve problems involving uncertainty, adaptation, or judgment. Specific focuses are on machine learning and planning, natural language understanding, and qualitative reasoning. Knowledge acquisition and representation and intelligent agents are also being pursued.

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ROBOTICS

Projects in robotics pursue the understanding of how to design, build, and utilize mobile, intelligent agents. Research is conducted in novel actuator design using muscle-like materials, tactile information processing, motion-planning algorithms, and artificial vision.

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COMMAND AND CONTROL

This program focuses on developing new approaches to support tactical decision makers in understanding their environment, effectively using sensor information, and making resource allocation decisions. Specific research involves real-time computer networks, decision aids, and collaborative planning.

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Operations Research

Program initiatives focus on mathematical programming and its application to problems in logistics, resource allocation, production, and command and control. The program supports research in linear, nonlinear, integer, and combinatorial optimization, and in sequencing and scheduling. Theoretical development, algorithm design and analysis, computational techniques for large-scale problems, and innovative and relevant applications are all of interest. The development of mathematical programming-based methods for solving large-scale logic problems is of particular interest.

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Circuits and Systems

This program focuses on developing innovative circuit architectures for high speed signal and image processing by employing the latest advances in electron devices. The program also investigates the reliability of electronic circuits and very large-scale integration (VLSI) chips and develops techniques to improve reliability and fault tolerance.

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Surveillance, Communications, and Electronic Combat Division

This division supports programs in surface and aerospace surveillance, communications, and electronic combat. Research areas in surface and aerospace surveillance include sensors, primarily radar and electro-optic/infrared, and associated signal and image processing methods. Areas of interest in communications include military radio communications with an emphasis on anti-jam and low-probability-of-intercept techniques, radio networks, and dynamic internetworking. Electronic combat research areas include threat warning systems, electronic support measures, decoys, and electronic countermeasures.

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Surface/Aerospace Surveillance

This program is devoted to the development of enhanced sensor technology, primarily radar and electro-optic/infrared and associated signal, image and array processing methods. Coverage includes wideband and phased-array radar technology, the enhancement of radar functionality through the integration of new operating modes (e.g., inverse synthetic aperture radar, synthetic aperture radar, and ground-moving target imaging), low-probability-of-intercept radar, passive targeting, and automatic target recognition. Additional efforts are ongoing in electro-optic/infrared system development, infrared clutter modeling and dim target detection, novel detection/discrimination techniques, and multisensor integration.

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Communications

This program supports improved radio communications, networking, and navigation systems. Areas of investigation in radio communications include: anti-jam/low-probability-of-intercept techniques, voice/data integration, increased throughput through bandwidth efficient modulation and data/image compression, and countercommunications. Areas of interest in radio networks include: interoperability, connectivity, adaptation of commercial standards, and utilization of commercial systems. Interest areas in antenna technology include: wideband multifunction antennas, compatibility of phased array antennas with naval platforms and marine environments, and submarine super high frequency communications. Research areas in navigation include Global Positioning System alternatives, including fiber optic and ring laser gyroscopes.

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ELECTRONIC COMBAT

The overall goal of electronic combat is to disrupt, deny, and exploit enemy use of the electromagnetic spectrum while ensuring its secure friendly use. To that end, ONR's electronic combat program provides improved threat warning systems, electronic support measures, decoys, and electronic countermeasures (radio frequency and electro-optic/infrared) as well as new and improved communication and navigation countermeasures.

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Programs related to the areas of Surface/Aerospace Surveillance, Communications, and Electronic Combat include:

Sensor Processing: Projects in this program develop algorithms and hardware (including photonic) required for storing, relaying, processing, and extracting target information from sensor outputs (signal and image data) in real-time.

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Signal Analysis: This program supports development of stochastic process theory and associated time-series and spectral/spatial analysis and processing methods as motivated by the need to detect and classify signals in noise, clutter, and interference.

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Systems and Communication Theory: Projects in this program develop techniques for target tracking, sensor/data fusion, and sensor resource management. In the area of communication there is interest in low-probability-of-intercept/anti-jam waveforms and radio communication networks and internetworking.

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Antennas and Propagation: This program supports electromagnetic propagation and interaction with emphasis on antennas, target and clutter/background modeling, and sensor performance prediction.

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OCEAN, ATMOSPHERE, AND SPACE SCIENCE AND TECHNOLOGY DEPARTMENT

The department consists of two divisions, Modeling and Prediction and Sensing and Systems, which produce affordable and integrated programs in sensing and prediction, environmental science, and sea-based and littoral zone warfare, including undersea warfare (mine, mine countermeasures, and antisubmarine warfare), expeditionary, and special warfare. The department's science and technology interests include the following: oceanography, meteorology, and space utilization for nowcast and forecast capabilities; environmental acoustic and electromagnetic (optical, radar, magnetic) scattering and propagation for use in inversion and assimilation methods; signal processing for undersea and near-shore surveillance (detection, classification, localization, tracking, and identification of targets, mines, and obstacles); acoustic transducers and arrays, sensor integration, all-source data fusion, and *in situ* instrumentation development, and the ability to test concepts and demonstrate new capabilities at sea and in littoral areas.

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Modeling and Prediction Division

This division concentrates on improving the Navy and Marine Corps' understanding of environmental evolution, the assimilation of data, and the limits of predictability. It plans, fosters, and encourages an extensive program of scientific inquiry and technological development in fields ranging from environmental optics to high-latitude dynamics. Fields of special interest to the division include environmental optics, physical oceanography, biological and chemical oceanography, ocean modeling and prediction, atmospheric modeling and prediction, high-latitude dynamics, tactical environmental support, marine geology and geophysics, and marine meteorology. In addition, each program maintains a book which is available through the program contacts, about its projects.

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ENVIRONMENTAL OPTICS

This program investigates the basic issues associated with the propagation of visible and infrared electromagnetic energy within the earth's coupled ocean and atmosphere system. Investigators characterize the physical, biological, chemical, and geological processes that affect optical propagation, including effects of the ocean boundaries (the ocean surface and the sea floor) and use this information to improve the capability of the Fleet to sense and characterize the natural environment. Major program thrusts include the development and testing of new radiative transfer models, laboratory and field experimentation to examine and model environmental processes that affect optical propagation, the development of *in situ* instruments for measuring inherent optical properties, the development of new underwater and atmospheric imaging systems, and the development of new passive and active optical remote sensing techniques. Presently, there is a strong desire within ONR to better understand the natural processes within coastal environments.

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PHYSICAL OCEANOGRAPHY

This program supports process-oriented and hypothesis-driven science leading to new technologies. In response to naval emphasis in the littoral environment, the program focuses on those processes in the continental margin region—that part of the ocean which is an average 200 km from shore. The region includes deep water and the continental slope and shelf. Interest continues, but at a lower priority, in open ocean processes that foster an understanding of the littoral environment by analogue. Interest has increased in marginal and semi-enclosed seas and straits. Physical processes under study include western and eastern boundary currents, fronts and eddies, air/sea interaction, surface and internal waves, the upper surface mixed and boundary layer, the lower bottom mixed and boundary layer, fine structure, and microstructure. High priority is given to the dynamic linkage among these processes, their relationship to atmospheric forcing and boundary conditions, and their degree of predictability. Strong emphasis is given to their role in biological, geological, atmospheric, acoustic, and optical processes with respect to their impact on current and planned Fleet operational systems and models. Overall, the program places strong emphasis on, and will encourage support of, new types of *in situ* and remote sensing instrumentation and techniques. The program fosters collaboration to facilitate transition of products such as numerical and theoretical models, analysis algorithms, *in situ* data, and seagoing instrumentation and platforms. Additional interests include boundary currents, fronts and eddies, air/sea interaction, surface and internal waves, mixed and boundary layers.

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BIOLOGICAL/CHEMICAL OCEANOGRAPHY

Investigators conduct research in biological and chemical distributions and processes in the benthos, the water column, and the marine atmospheric boundary layer. The goals are to develop greatly improved observational capabilities at small space and time scales (less than 1cm/less than 1 sec), and based on improved observations, to revise theories of ecological structure and function in the shallow water benthos and the upper 200 meters of the ocean. Enhanced knowledge of mechanisms defining the distributions of organisms and chemical species in the marine environment will lead to better understanding of the behavior of high-frequency sound and light in the ocean as well as light in the marine boundary layer. Additional topics of interest include aerosol dynamics; air-sea gas exchange; marine environmental quality; *in situ* chemical sensors; benthos; distributions and processes; plankton distributions; community structure and function.

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OCEAN MODELING AND PREDICTION

This program includes numerical modeling, ocean and acoustic modeling, and applied littoral oceanography. Investigators examine physical processes using numerical models and parameterize these processes for the development of ocean nowcast and forecast systems. Techniques are developed for ocean-atmosphere coupling, prescribing boundary conditions for littoral predictive systems, developing data assimilation methods for ocean forecasting, conducting model evaluation experiments, and developing ocean simulations for tactical applications. The goal of the program is to use the ocean environment to gain tactical advantage through the development of vertically integrated predictive models and improved environmental tactical decision aids, especially for acoustic and electromagnetic/optic systems.

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ATMOSPHERIC MODELING AND PREDICTION

This program sponsors integrated basic, applied, and developmental atmospheric research with emphasis on improving the modeling and prediction of environmental parameters critical to Navy and Marine Corps platform, sensor, and weapons performance.

The program, which includes research and development leading to enhanced environmental support for operations, training, mission planning, and systems development, focuses on addressing Navy and Marine Corps real-time, high-resolution environmental parameter requirements to support tactical sensors and operations in littoral zones worldwide. Additional topics of interest include coastally trapped disturbances; real-time environmental information networks; data assimilation, global mesoscale and on-scene modeling, simulation and visualization, and weather on target; marine boundary layer similarity and aerosols; electromagnetic propagation, electro-optic propagation, coastal variability analysis, measurement, and prediction; and systems development support.

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HIGH LATITUDE DYNAMICS

This program investigates processes (physical, biological, chemical, and geological) active in all polar oceanic areas with emphasis on the Arctic, including the ice pack and the marginal seas, with the goal of improving the Fleet's understanding of fluxes across the air-ice-ocean interface, sea ice fracture mechanics, cross-shelf transport, and acoustic and electromagnetic propagation. Because of logistical constraints imposed by the harsh polar environment, the development of low-cost, autonomous, self-adaptive sensor technology is a high priority. The program seeks to improve the understanding of high latitude processes with the goal of developing improved high latitude environmental models.

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TACTICAL ENVIRONMENTAL SUPPORT

This program sponsors oceanographic, atmospheric, and geophysical research and development in the littoral environment to support naval combat and weapons systems. The goals are to understand and assess oceanographic and environmental acoustic processes and their relevant effect on systems' performance. Of particular interest is the development of performance prediction models, simulators, and tactical decision aids in addition to developing predictive capabilities associated with scientific measurements that are compiled into reliable environmental data bases. The result of these endeavors will be improved performance of naval systems and weapons in the littoral environment.

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MARINE GEOLOGY AND GEOPHYSICS

This program seeks to understand the creation of the stratographic record on continental shelves and slopes as the product of geological processes acting with spatial and temporal heterogeneities. This understanding will lead to the development of models that are capable of predicting these stratographic patterns on a variety of continental margins. The overall program objective is to increase understanding of mechanisms that control structure, history, and dynamics of these geological features that in turn affect sound propagation, seafloor instability, bathymetry, and electromagnetic/optic transmissions in the water column and ocean bottom. Additional topics of interest include sediment processes, continental terrace studies, and long-term monitoring of the shallow seafloor.

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MARINE METEOROLOGY

This program funds research across military and civilian agencies with emphasis in the following categories: marine boundary layer clouds and turbulence, and Western and Southern Pacific tropical cyclone behavior and evolution in motion and structure. Emphasis is placed on those research efforts leading to increased understanding of the basic physical processes governing the behavior of the atmosphere on meso- and synoptic scales. Additional interests include motion and structure of Western and Southern Pacific tropical cyclones; topographically controlled and convectively driven coastal atmospheric processes; marine multiple layer and nonhomogeneous cloud systems; marine planetary boundary layer processes.

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Sensing and Systems Division

This division conducts an extensive program of scientific inquiry and technology development in ocean acoustics; space and remote sensing; sensing- information dominance; coastal dynamics; sensors, sources, and arrays; ocean engineering and marine systems; undersea signal processing; and tactical sensing support. The division's interests directly relate to Navy and Marine Corps operations, including undersea, expeditionary, and special warfare in littoral environments. In addition, the division manages the operation and maintenance of Navy research ships and other platforms.

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OCEAN ACOUSTICS

This program is striving to gain an increased understanding of the physics of generation, propagation, and scattering of acoustic and elastic waves in the temporally and spatially varying ocean environment. Program thrusts are propagation and scattering in shallow water regions (shelf, straits, etc.); high-frequency (10 kHz to 1000 kHz) acoustics; long range (1,000 to 10,000 km) sound propagation; inverse methods (tomography and imaging); and the acoustic reverberation special research program. The program goal is to improve existing and future active and passive system concepts in mine and antisubmarine warfare. Additional interests include propagation, scattering from the ocean bottom and subbottom, volume scattering, scattering from the air-sea interface, acoustic modeling, tomography and imaging.

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SPACE AND REMOTE SENSING

This program investigates the physical and chemical processes that govern active and passive electromagnetic spectrum scattering from the Earth's surface and propagation in the ionosphere. Of particular interest is short water wave roughness modulation mechanisms, surfactant effects; intermittency in wave breaking and nonlinear water waves; ionospheric irregularities effects on satellite transmissions and ultrawideband radar technologies. Investigators seek to improve the knowledge base for development of mechanistic electro-optic/electromagnetic clutter models and automatic target recognition, and to investigate techniques that invert sensor information for the development of algorithms for assimilation into environmental models. Additional interests include electromagnetic scattering theory; microwave properties, scattering surface characterization; wave and flux modulation mechanisms; geophysical modeling; upper atmosphere, ionosphere, and magnetosphere; precise time and time interval, earth orientation, and astronomy.

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SENSING--INFORMATION DOMINANCE

Program investigators explore environmental effects on nonacoustic sensors; multisource data correlation and information display; automated reasoning under uncertainty; real-time multimedia data bases; and large-scale, non-hardwired, high throughput mobile computer networks. The program is involved in the use of nonacoustic undersea sensors and their related signal processing; science and technology for environmental and target data fusion for undersea warfare, mine warfare, and expeditionary warfare; and worldwide ship tracking. Involvement in these areas aims to achieve robust and effective undersea surveillance in littoral regions; automatically form a seamless picture of the tactical situation including its environment; and accurately assess the meaning of that evolving picture to enhance performance of on-scene decision makers. Additional interests include nonacoustic distributed system components; light detection and ranging technology; superconducting quantum interference device radiometers; theater acoustic warfare; platform acoustic warfare data fusion; airborne periscope detection radar, airborne and shipborne periscope detection radar; and the effects of surface ships on clouds.

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COASTAL DYNAMICS

The study of coastal dynamics involves the fluid mechanics of the coastal ocean and atmosphere with emphasis on near-shore processes and associated sediment and bathymetric responses. Emphasis is placed on large-scale current dynamics; fluid motion and sediment responses; shelf, inner shelf, and strait dynamics; small-scale physical processes; instrumentation; and coastal meteorology. The overall goal of the program is to improve the knowledge base for development of coastal ocean models, bathymetry evolution, water clarity, and mine burial and transport. Additional topics of interest include shelf dynamics and near-shore processes.

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SENSORS, SOURCES, AND ARRAYS

This program conducts multidisciplinary science and technology for undersea sonar system hardware carried aboard aircraft, ships, and submarines. The program develops and demonstrates next generation acoustic sources and arrays and conducts studies of ambient and self-noise of new acoustic concepts. The primary areas of interest are in high-power, efficiency, and sensitivity but low weight and cost-of-transduction materials or designs; low volume and power, high-gain, intelligent, deployable components; and innovative towed body and hull system approaches to acoustic surveillance. Additional interests include sensors and sources, tactical systems science and technology, and surveillance systems science and technology.

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OCEAN ENGINEERING AND MARINE SYSTEMS

The goals of this program are to improve the knowledge base of fluid and structure interactions for engineering designs and to develop and demonstrate new technologies for expeditionary operations and special warfare. The investigators conduct multidisciplinary science and technology efforts in the behavior of ocean systems in general as well as specifically for the Marine Corps, Special Forces, and Navy Explosive Ordnance Disposal. The program focuses on nonlinear dynamics and coupled nonlinear interactions of fluids with structures, vehicles, and the seabed; stochastic versus deterministic behaviors; multispectral imaging of remote targets; real-time, far-field ultrasonic imaging of 3-dimensional objects; autonomous search and surveillance; hybrid propulsion systems; and underwater life-support system improvements. Additional interests include ocean engineering mechanics, special topics in ocean engineering, and expeditionary warfare technology and demonstration.

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UNDERSEA SIGNAL PROCESSING

This program pursues multidisciplinary science and technology for notional processing of undersea acoustic systems in detection, tracking, and identification of targets. Investigators develop affordable algorithms for detecting, classifying, and localizing small submarine targets in cluttered, shallow water environments with operationally useful probability-of-correct classification and probability-of-false alarm. The program seeks new concepts and algorithms to accurately and efficiently track diesel submarines, surface ships, and mine laying and other littoral undersea activities. Additional topics of interest include active signal processing and passive signal processing.

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TACTICAL SENSING SUPPORT

This program is interested in enhancing the resolution, range, image, fidelity/coherence, signal processing, and false target rejection of sonar systems. In the field of mine neutralization, the program is developing improved system deployment methods as well as methods to determine system effectiveness. Overall, the investigators seek to discover, improve, and demonstrate technologies for tactical data acquisition, offensive mining, mine countermeasures, and explosive ordnance disposal. The program supports multidisciplinary science and the development of technology related to improving undersea sensors and sensing for mine warfare as well as other expeditionary warfare requirements. Additional topics of interest are high area rate reconnaissance, shallow water and very shallow water acoustic sensors, sensor image and signal processing, shallow water mine neutralization technologies, surf zone deployment technology project, surf zone mine neutralization project, anti-mine projectile project, amphibious assault configured minefield theory and operational observables, advanced lightweight influence sweep system, explosive neutralization advanced technology demonstration, and selected lasar scanning systems.

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RESEARCH FACILITIES

This program manages the operation and maintenance of ONR research ships and other platforms in support of Department of the Navy and national science and technology projects. The program supports shiptime, Fleet modernization (littoral capabilities), and remotely operated vehicle (ROV) technologies (manipulative capabilities). Program goals include modernization of the research vessel Fleet for the 21st century and exploration of the use of other specialized platforms (e.g., ALVIN, ROVs, airships, etc.) to increase science and technology capabilities at sea.

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ENGINEERING, MATERIALS, AND PHYSICAL SCIENCE AND TECHNOLOGY DEPARTMENT

Four divisions comprise this department: Materials Science and Technology; Mechanics and Energy Conversion Science and Technology; Physical Sciences Science and Technology; and Ship Structures and Systems Science and Technology. The divisions contribute to naval strengths in the areas of chemistry, physics, structural materials, functional materials, structural mechanics, solid mechanics, fluid mechanics, propulsion and energetics. Ideas and techniques developed in these areas are applied to surface ship, submarine, and other undersea weapons systems and improve naval warfighting effectiveness and opportunities for environmental amelioration in all aspects of Fleet operations.

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Materials Science and Technology Division

This division is responsible for naval science and technology projects associated with materials and processes with the exception of materials for semiconductor electronic devices. The division's multidisciplinary programs support a wide spectrum of naval platforms and missions, including materials for ships and submarines, aircraft, tactical missiles, propulsion systems, satellites, shore facilities (especially piers and wharves), acoustic transducers, superconducting systems, and numerous subsystems. In addition to materials, emphasis is placed on materials processing and improvement in such areas as welding, nondestructive evaluation, and corrosion control.

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MATERIALS AND PROCESSES FOR LIFE EXTENSION, RELIABILITY, AND AFFORDABLE PROCESSING

This project provides essential materials and processing-oriented science and technology focused on reducing the procurement and maintenance costs of naval platforms, systems, and components without compromising their warfighting capabilities. Material life extension is addressed through efforts in advanced coatings, cleaning materials, lubricants and fire retardant materials. Reliability efforts are concentrated in nondestructive inspection and evaluation, condition-based monitoring and life prediction. Affordable materials processing technologies include the development of novel, cost-effective forming and net-shape processing techniques for homogeneous, composite, and graded materials. Specific task areas include coatings, corrosion, and oxidation; condition-based monitoring and life prediction; material processing science and technology; nondestructive evaluation and inspection, and tribology and adhesion science and technology.

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Coatings, Corrosion, and Oxidation: Projects under this task develop corrosion control approaches founded on the use of new materials, new coatings, passive films, and resistance to environment-induced cracking.

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Condition-Based Monitoring and Life Prediction: This task provides more accurate life prediction capability for materials by developing quantitative cyclic (fatigue) damage evolution models incorporating microstructural and macrostructural parameters, replacement materials, and designs.

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Material Processing Science and Technology: This task supports research and development in materials processing and component fabrication technology to increase the flexibility and affordability of production. Emphasis is placed on model and simulation-guided intelligent processes and innovative layered or solid free form methods directed toward development of techniques with costs that are quantity insensitive. Additional emphasis is applied to the processing of nanostructural powders and other precursor materials for multiple applications.

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(Nanostructural Materials)

Nondestructive Evaluation/Inspection: This task develops cost-effective technologies for the detection and assessment of critical defects in naval structures and materials.

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Tribology and Adhesion Science and Technology: The objective of this task is to increase the understanding of tribological mechanisms and to develop adhesion technology to enable a broader application of advanced structural and specialty materials.

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MATERIALS AND PROCESSES FOR SURVIVABILITY, SITUATIONAL AWARENESS, AND WEAPONS DELIVERY

This project's principal goals are to provide enabling materials technologies that ensure the survival of personnel and their equipment while also assuring maximum effectiveness of naval forces through situational awareness, the accuracy and lethality of weapons, or the effective suppression of weapons. Specific tasks associated with the project include electromagnetic transparencies, electronic packaging and thermal management, high-temperature superconducting ceramic materials, magnetic materials, and piezoelectric and electrostrictive materials.

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Electromagnetic Transparencies: This task focuses on the development of new materials and processes for the fabrication of infrared and radio frequency windows and domes with significantly enhanced resistance to erosion by rain and particles. It is also involved with the development of new materials and strategies for eye and sensor protection from laser threats.

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Electronic Packaging and Thermal Management Materials: This task focuses on developing new thermal management packaging materials and processes to enable high-performance computing. Current emphasis is placed on the development of very high conductivity fibers and composites for electronics applications.

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High Temperature Superconducting Ceramic Materials: This task targets the synthesis and processing of high-temperature ceramic superconductors for a broad spectrum of Navy and Marine Corps systems, such as superdirective ultra-high frequency and very high frequency antennas for missile guidance.

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Magnetic Materials: This task seeks to identify and develop magnetic materials to increase naval capabilities, including identification, targeting, sensing operations, and ship and weapons propulsion. Materials currently under investigation include ferrites and other magnetic oxides, large magnetostrictive alloys, thin films, and nanoscale structures exhibiting novel magnetic properties.

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Piezoelectric and Electrostrictive Materials: This task focuses on devising and developing piezo-electrostrictive ceramics and composites for electromechanical transduction for a broad spectrum of Navy and Marine Corps systems.

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STRUCTURAL AND PROPULSION MATERIALS

Projects focus on materials tailored for structural and mechanical performance in naval systems. In particular, materials with high specific properties even under severe environmental conditions, such as high temperature or shock loading, are emphasized. Among the materials being pursued under this project are tough ceramics, advanced metallized ceramic composites, and materials with graded chemistries and microstructures. Specific tasks associated with this project include airframe materials, missile and spacecraft materials and propulsion materials; ship, submarine, and hydrospace materials; and shore facilities materials.

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Airframe Materials: This task develops high-strength, low-density, corrosion-resistant materials for airframe structures in order to support improved aircraft and missile performance. Current emphasis is placed on lower density, higher stiffness alloys, ultra-high strength steels, fire-resistant and nontoxic resin-matrix composites, and high-temperature materials for missile airframes.

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Missile and Spacecraft Materials and Propulsion Materials: This task supports superior aircraft performance capabilities through the development of materials with improved mechanical and physical properties. It develops mechanistic understanding and mechanical and environmental behavior data bases for cost-effective, high-performance materials capable of use in severe temperature and operational environments. Materials with high-strength, stiffness, and light weight are being developed. Also of interest are materials with enhanced vibrational damping and shape memory capabilities.

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Ship, Submarine, and Hydrospace Materials: The object of this task is to provide more affordable superior performance seaborne materials and associated fabrication technologies in support of the operational requirements of naval ships, craft, submarines, torpedoes, and other underwater vehicles. Performance issues include those relating to the lethality of weapons, such as torpedo warheads, the reduced signature, damage tolerance and survivability of naval vehicles, with respect, for example, to fracture resistance under corrosive, cyclic and dynamic loadings. Fabrication issues include those relating to more affordable and reliable welding and other joining technologies as well as other aspects of materials processing. Computer simulation, first principles, and other innovative approaches are sought to advance predictive capability.

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Shore Facilities Materials: This task supports the development of airfield pavements with improved resistance to heat damage from naval aircraft and also the development of advanced pier and wharf materials and related repair techniques. Current emphasis is being placed on the development and characterization of corrosion resistance and stronger materials for the repair of piers and wharves to significantly extend infrastructure life.

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Mechanics and Energy Conversion Science and Technology Division

This division is involved in the following areas: fluid dynamics (hydromechanics, free-surface/two-phase flows, turbulence, flow/structure interactions, propulsors), energy conversion (energetic materials, propellants, explosives, combustion, propulsion processes, reacting flows), and undersea weapons technology.

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FREE-SURFACE AND TWO-PHASE FLOWS

This program's goals are to understand, predict, and control the behavior of hydrodynamic free-surface and two-phase (gas-liquid) flows. Such flows involve the interaction of waves, wakes, bubbles, turbulence, and solid boundaries.

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TURBULENCE

This program deals with high Reynolds number and nonequilibrium effects of turbulence in separated, unsteady hydrodynamic flows. In such flows, the large range of temporal and spatial scales require combinations of modeling, measurement, and simulation approaches.

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PROPULSORS AND FLOW STRUCTURE INTERACTIONS

This program's goals are to understand, predict, and control the flows around marine propellers. Such flows are characterized by unsteady, separating, and rotational effects and have complex initial and boundary conditions.

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ENERGETIC MATERIALS

This program develops and exploits new energetic materials and processes through its emphasis on the synthesis, characterization, manufacturing, and combustion of energetic materials. The approach links microscale events at the molecular level with macroscale observables such as combustion instabilities. These materials are used as propellants and/or explosives.

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PROPULSION

This program develops and exploits new liquid fuels and combustion tailoring. The emphasis is on understanding, predicting, and controlling fuels and their combustion behavior for improved performance and reduced emissions

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UNDERSEA WEAPONS TECHNOLOGY

This program deals with various aspects of undersea weaponry technology such as guidance and control, electric and thermal propulsion, and unmanned undersea vehicles (UUV's).

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Physical Sciences Science and Technology Division

This division focuses on research associated with the following areas of science and technology: physical chemistry, atomic and molecular physics, polymer chemistry, electrochemical science and technology, solid-state and surface chemistry, organic and organometallic chemistry, nonlinear dynamics, physical acoustics, lasers and electro-optics, plasma physics, environmental quality, amphibious logistics and facilities repair technology, and logistics technology. A preferred form for new and renewal proposals to this division may be obtained from:

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PHYSICAL CHEMISTRY

This program develops relationships between fundamental atomic and molecular properties and macroscopic physical states and chemical reactivity. Primary areas of interest include research relating to the chemistry and physics of sliding contacts and the development of a molecular-level understanding of lubrication. Challenges addressed by the program include the ability to characterize and understand interfaces, develop *in situ* sensing capabilities for interfaces, and produce first principle understandings of complex phenomena.

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ATOMIC AND MOLECULAR PHYSICS

This program's research seeks to understand and exploit the interactions of light (treated fully quantum mechanically) with atoms and molecules to control chemical reactions and atomic processes. Areas supported in the program include laser cooling and trapping, coherent control, and femtosecond pulse shaping. Also supported are novel theoretical methods for computational electronic structure. Challenges addressed include the physics of ultra-cold collisions, the ability to control chemical dynamics and branching ratios, strong electron correlations in materials, and the ability to predict properties of materials.

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POLYMER CHEMISTRY

This program's emphasis is on advanced polymeric materials including polymers for optical applications (e.g. opto-electronics, second harmonic generation), membranes for water purification, electrostrictive polymers, and polymer surface science. Challenges for the program include efficiency of electroluminescent films, molecular keys to fouling-free polymer membranes, tough fouling-release coatings, and the compositional and morphological basis for unusually high polymeric electrostriction.

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ELECTROCHEMICAL SCIENCE AND TECHNOLOGY

This program develops a foundation of electrochemical sciences and technology and exploits this knowledge for energy and power systems. Areas of interest include new electrode and catalyst materials and processing, interfacial structure and dynamics, and small domains. Specific challenges being addressed include *in-situ* diagnostics, improved electrocatalysts and membranes, and higher specific energy and power systems.

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SOLID STATE AND SURFACE CHEMISTRY

This program exploits new concepts in solid state and surface chemistry to further technological advances in thermal management, detection and sensing, and communications. Specific areas of interest include advanced materials for processing, thin- and ultrathin-film science, chemical compatibility, and interfaces. Challenges addressed by the program include efficiency in electronic optical materials, multispectral sensing devices, smart pixel development, fundamental processes, thin film deposition processes, etching and deposition processes, and growth technology for Josephson junctions.

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ORGANIC AND ORGANOMETALLIC CHEMISTRY

The program seeks to develop novel precursors to improved electronic and optical materials, new organic compounds and assemblies that depend on long-range forces for their properties, and new environmentally compliant technologies. Areas supported include organometallic routes to new materials, supramolecular assemblies and devices, marine bioadhesives, and fouling release coatings and sensors. Challenges for the program include designed chemical routes to electronic, optical, and nanostructural materials, and supramolecular device design and fabrication.

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NONLINEAR DYNAMICS

This program seeks to exploit dynamical instabilities and resonances to improve the control and performance of devices. Areas of support include control of chaos, detection via nonlinear resonances, nonlinear wave dynamics, ocean wave dynamics, and dynamical signal analysis. Challenges addressed by the research program include synchronization of chaotic circuits, control of ship-based cranes in high sea-states, chaos control of blue-green lasers, and nonlinear processing for anti-submarine warfare classification.

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PHYSICAL ACOUSTICS

This program seeks to discover and apply innovative acoustic techniques for determining fundamental and engineering properties of materials and processes for naval applications. Areas supported include ultrasonic measurements, nonlinear acoustics, and thermoacoustic processes. Challenges addressed by this program include the ability to measure and correlate acoustic measurements of physical properties, nonequilibrium properties and processes, and the limitations of thermoacoustic processes.

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LASERS AND ELECTRO-OPTICS

The objectives of this program are to conceive and develop new laser concepts, and apply ideas involving quantum optics. Areas of specific concern include atomic interferometry (atom optics), squeezed states, and lasing without inversion. Specific challenges are associated with ultrasensitive magnetometers, tunnel detection, and improved quantum-limited optical gyros.

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PLASMA PHYSICS

This program seeks to develop and exploit a predictive capability with regard to the collective and nonlinear dynamics of plasmas. Areas of interest include nonneutral plasmas in traps and laboratory experiments related to space plasmas. Specific challenges include fluid dynamics, transport across fields, nonlinear dynamics of instabilities, and coherent free electron sources.

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ENVIRONMENTAL QUALITY

The program seeks to develop technology that leads to affordable environmental compliance and pollution prevention afloat and ashore. The program focuses on technologies that are directed toward environmentally sound ships, air quality from marine power plants, and sediment issues. Specific research includes *in-situ* sensors, new thermal destruction techniques, and improved cleaning methods.

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AMPHIBIOUS LOGISTICS AND FACILITIES REPAIR TECHNOLOGY

This program focuses on the development of repair and diagnostic capabilities for waterfront structures and investigates support technologies for forces conducting amphibious operations. Areas supported include diagnostic techniques and repair of aging infrastructure and support of land forces through improved lighterage design, site characterization, and consumable supply support.

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LOGISTICS TECHNOLOGIES

This program supports the development of technologies that will lead to a sustainable, affordable, and environmentally compliant naval force. Specific areas of support include condition-based maintenance, underway replenishment, and advanced metrology. Challenges addressed in the research include reduced lifecycle cost, reduced cost for maintenance, and the design of cost-effective test equipment.

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Ship Structures and Systems Science and Technology Division

This division supports research in solid mechanics, structural acoustics, structural dynamics, computational mechanics, control of dynamic systems, dynamics of electric power networks and control, and control of acoustic and nonacoustic signatures. In addition, the division supports exploratory development of technology for ships and submarines in the following areas: structural systems, power and automation, signature control, maneuvering and seakeeping.

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MECHANICS OF METALS

Projects further the understanding of nonlinear behavior and the failure mechanisms of materials subject to static, dynamic, and thermomechanical loads as well as electromagnetic fields. The research emphasizes constitutive models for high strain rate, cyclic loading, and the fundamental aspects of fracture, including criteria for welds and high toughness metal alloys. There is interest in active materials for controlling machinery and structures, including micromechanical aspects of high strain, high force, and high frequency actuators. Also of concern are intrinsic and thermal stress issues in semiconductors, factors underlying brittle-to-ductile fracture transition, and other mechanical properties of materials.

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SOLID MECHANICS OF COMPOSITES

This program investigates deformation, damage initiation, damage growth, and failure in composite materials subjected to complex loading conditions in severe environments (i.e., those involving moisture, seawater, and extreme temperature and pressure). The research program goal is to establish physically based quantitative theories and models with predictive capabilities, to provide a basis for assessing structural integrity, and to improve the design of reliable naval structures. Areas of emphasis include constitutive behavior, failure modes, failure criteria, environmental effects, dynamic response, and structural effects. Research is conducted at different spatial scales, extending from the microstructure and morphology of reinforcing fibers and their interfacial regions to the macroscopic buckling of thick walled cylindrical shells, and temporal scales, which span the real-time delineation of failure processes under dynamic loading and long-term creep behavior and life prediction for composite structures designed to last several decades. Presently, the major focus is on polymer-matrix composites for applications in naval structures.

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STRUCTURAL ACOUSTICS AND STRUCTURAL DYNAMICS

This program investigates the physical mechanisms of broadband structural acoustics, acoustic signature characteristics, acoustic holography, wave vector decomposition, wave decomposition in structures, and Eulerian-Lagrangian representations of fluid loading effects, bifurcation, and damage prediction for large structures, including shells, truss structures, and conventional naval structures.

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COMPUTATIONAL MECHANICS

This program develops modeling techniques for the linear and nonlinear dynamics of solids, structures, and fluid and structure systems, including modeling for vibration, nonlinear deformation, and failure. Areas of emphasis include structural acoustics of complex systems and structural response to explosive loading.

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CONTROL OF DYNAMIC SYSTEMS

This program involves innovative control methodologies and control strategies for both nonlinear and linear dynamical systems. Primary areas of interest include research relating to active, passive, and hybrid active/passive control of processes and dynamics in structural systems, electromechanical systems, and other systems. These include both high- and low-level controls for weapons and unmanned underwater vehicles. Technical challenges include developing universal controllers for nonlinear dynamical systems, the control architecture, partition, and integration for various control approaches, including the optimization of control algorithms such as fuzzy logic.

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CONTROL OF ELECTRIC POWER SYSTEMS

This program addresses research issues related to power electronic building blocks and the networks in which they will be used. Topics include nonlinear control of power and switchable power, electromagnetic interfaces, electronic power systems design and architecture, signal processing, advanced electronic controls (e.g., chaos theory, neural networks, wavelets theory, and other advanced research algorithms).

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SHIP STRUCTURAL SYSTEMS

This program's focus areas of advanced metallic structures, affordable composite structures, and weapon effects reflect its interests in probabilistic-based ship structural design, high quality and low cost organic composite systems, design analysis methods for composites, and the effects of weapons on ship structures and systems. Goals are to increase the affordability and reliability of ship structures, improve performance, accommodate next generation technology by the use of composites, and reduce vulnerability to weapons.

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SHIP POWER AND AUTOMATION

Projects are focused on three major systems: advanced electrical systems, mechanical power and auxiliary systems, and damage control. Within these areas, program interests include new electrical machinery technologies and distribution architectures, high power solid state devices, diesel fed fuel cells, and lightweight nonmagnetic diesel engines. There is also strong interest in improving the understanding of fire and smoke spread mechanisms, fire fighting alternatives, and automated damage control. The overall goals are to support the achievement of more affordable and survivable power and machinery systems.

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SHIP SIGNATURE CONTROL

Program projects focus on five major areas of effort associated with ship signatures: radar cross section; infrared (IR); electromagnetic compatibility; underwater acoustic; and underwater electromagnetic. Technology interests include radar absorbing concepts and shaping alternatives to reduce radar cross section; IR suppression methods for stacks and surfaces; system concepts and analytics for control of ship external electromagnetic emissions; quieting technologies for reduction of underwater acoustic signature; and sensors and controls to actively control underwater magnetic signature. The guiding purposes of the effort is to reduce the susceptibility of ships to detection and targeting.

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SHIP MANEUVERING AND SEAKEEPING

Projects focus on three areas of effort: motion prediction and control concepts; hull form concepts, and propulsor concepts. Technologies of interest include design procedures and concept validation, concepts for reduced resistance and wake, and propulsor concepts for increasing performance while reducing signatures. Goals associated with this effort include increasing the operating envelope in high sea states, reducing signatures, and increasing the fuel efficiency of ships.

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SUBMARINE STRUCTURAL SYSTEMS

Projects involve hull dynamic response, underwater weapon effects, damage prediction, and shock isolation systems.

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SUBMARINE SIGNATURE CONTROL

The focus of this program is on the prediction and control of acoustic and nonacoustic signatures. Concepts are developed from an understanding of underlying physics and subsequent integration with system and platform requirements.

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SUBMARINE POWER AND AUTOMATION

Developments in this program are focused in three areas: machinery and electrical systems, propulsion power systems, and machinery acoustics. Included are distributed auxiliary and electrical systems, and integrated propulsor concepts. Specific approaches include reduced cost acoustic treatments through active control, magnetic bearings, and analytical tools to predict the acoustic performance of components and systems.

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SUBMARINE MANEUVERING AND SEAKEEPING

Projects in this program are involved with exploratory development in support of advanced submarine design and operation, including maneuvering and control, propulsion and resistance, and torpedo launch systems. Advanced concepts are being developed through the use of computational ship hydrodynamics, appropriately validated with towing tank and maneuvering basin experiments. Interests include real fluid effects for extreme maneuvers and control utilizing neural nets and fuzzy logic, integrated stern and propulsor concepts, and two-body problems and the mutual interactions between a maneuvering submarine and a weapons launching operation. Priority is placed on development of unsteady Reynolds-Averaged Navier-Stokes computational capability.

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PERSONNEL OPTIMIZATION AND BIOMOLECULAR SCIENCE AND TECHNOLOGY DEPARTMENT

The department encourages the development of integrated research programs that carry basic research through to applications for the Department of the Navy, Department of Defense, and industrial users. It is committed to a program of active exploration at the leading edges of biotechnology, personnel performance, military medicine, training and human factors, neural information processing, and biorobotics.

Two divisions, Biological and Biomedical Sciences and Technology, and Cognitive and Neural Sciences and Technology, make up the department. Programs supported by the divisions range from molecular, cellular, tissue, and organ systems research to investigations of neural, perceptual, and cognitive levels of organization, with an emphasis on the reverse engineering of biological systems to develop devices for Fleet operations. Additional emphasis is placed on the study and exploitation of biological processes toward protection of the environment.

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Biological and Biomedical Science and Technology Division

Naval interests addressed by this division include deterioration of ships and platforms in marine environments due to biocorrosion and biofouling, the need for novel materials and catalysts; requirements for sensitive and selective detector systems (chemical, biological, bioacoustic, etc.); compliance with regulations maintaining the quality of shipboard and nearshore marine environments; molecular and cellular marine biology, including basic principles governing molecular structure, function, and interactions; marine biology at the environmental level; compliance with regulations maintaining the quality of shipboard and nearshore marine environments; and the health and performance of Navy and Marine Corps personnel. Biomedical programs are directed at improving acute care of the combat casualty and the diver, as well as maintenance of health in shipboard environments. These programs are managed jointly with the Naval Medical Research and Development Command in Bethesda, Maryland. Funded research areas include but are not limited to the programs listed below.

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BIOLOGY PROGRAM

BIODETERIORATION

The deterioration of man-made materials in the marine environment compromises not only naval missions but leads to excessive maintenance costs. This program targets the control of biological degradation of material or system performance due to fouling or biologically influenced corrosion. The research ranges from mechanistic studies to the design, test, and evaluation of antifouling/anticorrosive technologies for naval application. The program includes the thrusts noted in the following paragraphs.

Biofouling: Specifically, this area refers to the control of biofouling through environmentally benign methods and technologies. Basic research that addresses bioadhesion mechanisms as well as applied research associated with test and evaluation of environmentally benign antifouling agents and technologies is sought.

Biocorrosion: The objective in this area is to define the fundamental mechanisms of microbially induced corrosion with the goal of developing new treatments or materials to prevent or retard this process.

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BIOMATERIALS

The diversity of materials made and used by biological systems, particularly marine systems, offers design and process-based insights into the construction of novel materials for naval applications. This program seeks to ascertain the functional properties of biologically produced or inspired materials or processes that offer unique properties in terms of environmental acceptability, expanded or enhanced performance characteristics, and cost benefits for a broad range of naval uses. The following paragraphs describe the program's focus areas.

Biocatalysis: The design and redesign of biocatalysts for use in a wide range of solvents with simplified group transfer cofactors for new materials, devices, and processes (e.g., propellants and fuels, lubricants, surfactants, foams, polymers, fuel cells and batteries, and molecular switches.)

Biomimetics: The use of the principles of molecular recognition and combinatorial science to design self-assembled nanostructures as the basis for channels, tubular polymers, molecular wires, clusters and active materials

Biofabrication: Marine organisms manufacture structures (e.g., coccoliths, frustules, and spicules) in the 1 to 100 nm size range. This program explores the molecular (including cellular and biochemical) mechanisms used by marine organisms to assemble such structures. The primary focus is on understanding what cellular, biochemical, or biophysical mechanisms control the size and shape of molecular composites

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BIOSENSORS

Because the Fleet needs technologies for assessment and quantification in real-time of analytes ranging from metal ions to microbes, the biosensors program develops ideas for both molecular and cell organism-based sensors. In addition, this program engineers biologically inspired prototype sensors by testing new array and signal transduction concepts, surface chemistries, pattern recognition algorithms, and sampling strategies. The focused research and development thrust areas that contribute to these goals include:

Biomolecular Recognition: The definition and characterization of the atomic requisites for specific inter/intra-molecular recognition, binding, and reactivity in biomolecules.

Combinatorial Synthesis: The exploitation of massively parallel synthesis of polymers of defined length and sequence through biological, biomimetic, and bioorganic strategies.

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ENVIRONMENTAL BIOTECHNOLOGY

The Fleet seeks technologies that will improve the ability of base and ship operations to comply with environmental regulations. Specific research thrusts in this area are covered in the following paragraphs:

Marine Sediments: Because the environmental fate of pollutants in harbors and nearshore marine environments is determined by biogeochemical processing, this program focuses on understanding how natural communities of micro-organisms mediate biochemical transformations of pollutants leading to detoxification.

Shipboard Waste Effluents: Biological process and biotechnologies may be harnessed to solve Navy environmental problems such as the treatment of shipboard waste effluents. Novel developments in microbiology, enzyme catalysis, and new materials coupled to engineered treatment systems will help reduce the environmental impact of oily and non-oily wastewater.

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MARINE BIOLOGY

From bacteria to marine mammals, the physiological adaptation mechanisms of marine organisms provide a fertile source of materials, catalysts, and engineering principles that, if understood at their most basic levels, could provide the Fleet with new approaches to meeting many of its logistical and operational needs. The following paragraphs details this program's thrusts.

Algal Biotechnology: Marine algae are likely sources of novel materials and processes of value to the Navy and Marine Corps. This program exploits and develops biochemical, cellular, and molecular tools (e.g., marine algal viruses) for characterizing materials such as polymers, enzymes, surfactants, fuels, and composite structures.

Biological Sonars: Sonar is a valuable technology for finding and identifying objects in the marine environment. This program investigates those features of marine mammal sonars that might be replicated in engineered sonars to improve performance of naval sonar systems.

Bioluminescence: Light production in marine environments is regulated by environmental and genetically determined factors. This program investigates the molecular and physiological mechanisms governing bioluminescence.

Low Frequency Sound: Although low frequency sound (LFS) is used by marine mammals for long-range sensing and communication, man-made LFS poses a potential hazard to marine mammals. This program seeks to understand the mechanisms by which LFS is generated and detected by marine mammals and to evaluate the impact of man-made LFS on marine mammals.

Marine Mammal Physiology and Locomotion: Marine mammals have extraordinary physiological and mechanical capabilities for diving and aquatic locomotion. This program seeks to investigate those aspects of marine mammal adaptations which promise to yield new technologies for use by human divers or for the design of novel propulsive mechanisms that reduce noise and energy expenditure and increase maneuverability.

Molecular Biology of Marine Organisms: The focus in this program is on developing a mechanistic understanding of the novel physiological activities of marine organisms (bacteria, fungi, algae, and invertebrates) that might provide new leads for the design and manufacture of catalysts, materials, and novel processes or biotechnological capabilities. The overall marine biology program also targets the development of tools and technologies for studying and manipulating marine organisms.

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BIOMEDICAL PROGRAM

The Navy Biomedical Program is managed as a partnership between the Office of Naval Research and the Naval Medical Research and Development Command (NMRDC). NMRDC programs are primarily directed at intramural research efforts focused on essential Navy and Marine Corps medical operational readiness capabilities; however, extramural programs are supported in selected areas. The extramural programs at the two sites are described below.

Aviation Medicine and Human Performance Research

This program plays a vital role in solving medical problems unique to the naval aviation community. Research supports fleet operations, aircrew selection, and aircraft design, and provides benefits to the non-aviation community as well. Specific problem areas are protecting military personnel from operational and materiel hazards, enhancing individual and unit performance under all operational conditions, developing performance models and realistic system safety/design criteria, quantifying performance criteria to improve operational concepts and doctrine, and providing biomedical products and information in support of naval aviation system acquisitions.

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Cell Biology of Trauma

Traumatic injury is commonly associated with cellular hypoxia, either localized or generalized as in hemorrhage. A better understanding of how cells adapt to hypoxia may offer new therapeutic targets for treatment of ischemic injury. Research issues of interest are changes in gene expression following cellular hypoxia/anoxia, mechanisms of membrane damage and membrane recovery following cellular hypoxia/anoxia, mechanisms of mitochondrial dysfunction and recovery following hypoxia/anoxia, and novel resuscitation fluid components and test systems

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Combat Casualty Care

This program, NMRDC's largest, directs research that enhances fleet health care, augments field treatment capabilities, and improves the medical logistics necessary to support Navy and Marine Corps personnel. Specific problem areas of emphasis are blood products and blood substitutes, organ replacement technology, extreme environment medicine, and planning and management tools/equipment.

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Diving and Submarine and Special Operations Medical Research Program

This program represents a Navy-unique center of excellence. Current research focuses on solutions to medically-related problems identified by the Navy's submarine, diving, explosive ordnance disposal, and special warfare communities. Specific problem areas are

Diving: Prevention and treatment of decompression sickness, prevention of diving casualties due to oxygen toxicity, minimizing the thermal stress with undersea activity, enhancing divers' health and safety, and identifying biomedical/physiological principals with underwater breathing equipment.

Submarine Systems: Decreasing effects of air contaminants, enhancing submarine habitability, defining suitability for submarine duty, determining management of sickness/trauma while minimizing medical evacuation, threat analysis and physiological/pharmacological interventions with submarine rescue and submarine escape, and enhancing safety with visual and auditory sonar techniques.

Special Operations: Decreasing injuries related to overuse/training, enhancing management of trauma, and sustaining optimal performance.

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Environmental and Occupational Medicine Program

In certain operational environments Navy and Marine Corps personnel are at risk of exposure to physical, chemical, and biological hazards that may threaten their health and degrade operational performance. Research is directed at establishing effective standards for occupational safety and health, environmental protection, damage, and fire prevention. Specific problem areas are shipboard toxicology, bioeffects of electromagnetic radiation (EMR), hearing conversation, and risk analysis research/health promotion.

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IMMUNOPHYSIOLOGY

Cytokines are peptides produced largely by the immune system that appear to be critical mediators of shock following trauma. Research issues of interest are: the role of the nervous system in the induction of cytokines following trauma, effect of trauma-induced cytokines on endocrine function, and mechanisms of brain entry by cytokines and their neural targets

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Cognitive and Neural Science and Technology Division

This division supports two broad areas personnel optimization and bioengineering. Programs in personnel optimization affect how the Navy and Marine Corps will select, assign, and train personnel, support and augment their performance in stressful environments, and organize them into effective teams and command-control organizations. Programs in bioengineering, which exploit the unique designs of biological neural systems, develop novel information processing architectures and algorithms potentially implementable in engineered systems. These programs bring to future naval systems new means for sensing, pattern recognition, learning, locomotion, dexterity, and the development of adaptive controls that approximate human functionality.

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VIRTUAL ENVIRONMENTS FOR TRAINING

Projects in this program support interdisciplinary research and development addressing issues of perception, software architecture, and content representation in creating the illusion of immersion in remote environments. Application areas are diverse and include training in ship handling and surgery.

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HUMAN-SYSTEM INTERFACE

Program projects develop principles for the design of interactive displays to support tasks ranging from aircraft piloting to tactical decision making. The current emphasis is the use of cognitive models in display design and developing the principled basis for the use of multimedia interfaces for training.

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DECISION MAKING

Projects support research and development of decision support systems and displays based on a cognitive task analysis of the user. Application areas support tactical decision makers in antiaircraft and antisubmarine warfare contexts. The current emphasis is on collaborative distributed decision making in joint and coalition warfare scenarios.

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ORGANIZATIONAL DESIGN

This program supports development of analytic and modeling approaches to the design and evaluation of large-scale organizations. Special emphasis is placed on the design of situationally adaptive and structurally reconfigurable command and control architectures.

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PERSONNEL READINESS

Projects in this program focus on performance metrics and models that define readiness and relate readiness to personnel parameters. Performance metrics and models are developed at multiple levels, including those representing individuals, teams, and ships.

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NEURAL COMPUTATION

This research fosters a better understanding of the organization, structural bases, and operational algorithms characterizing information-processing networks within neural systems. The goal is to uncover neural architectures and algorithms that can be emulated to yield artificial information-processing capabilities of kinds now unique to biological systems.

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NONLINEAR NEURAL DYNAMICS

This is an interdisciplinary program with the objective of conducting neurophysiological, modeling and mathematical investigations which apply novel concepts of nonlinear dynamics to neural systems in order to characterize the dynamics and role of noise in neural ensembles and understand how instabilities are exploited in neural computation. The scientific objective is the development of formal models which place neural dynamical systems and physical dynamical systems in a common framework.

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LEGGED LOCOMOTION

This program makes use of simple nervous systems involved in sensorimotor performance to specify the circuits involved in adaptive legged locomotion in invertebrates. The objectives of this program are to develop neural models that reproduce the experimentally derived characteristics of the neuronal circuitry underlying legged locomotion and new controller architectures for autonomous legged robots which exhibit stable locomotion, and which respond adaptively to unknown terrain and obstacles.

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HYBRID NEURAL SYSTEMS

The goal of this program is to develop hybrid architectures that integrate physical models and neural networks into adaptive systems that allow prediction in complex physical systems, and also permit physical interpretation of the predictions. This research addresses the need to combine sensor-driven and model-based analyses in order to build a comprehensive picture of physical systems. Navy applications of interest include predictions of fault progression in mechanical systems, and simulations of complex fluid dynamics problems such as underwater vehicle control.

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ADAPTIVE NEURAL SYSTEMS

The principal focus of investments in this area is to uncover the range of neural mechanisms that contribute to learning, memory, and adaptive performance. This adaptive property of neural systems has traditionally been called "neural plasticity," and it involves the ability of a biological system to modify cognition and behavior on the basis of experience. This program stresses mechanisms rather than process description. The mechanisms will be sought via neurophysiological/anatomical/biochemical/behavioral experiments and modeled via computer simulations. These simulations will require a computational approach of the neuroscience data.

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NEUROMORPHIC SYSTEMS

The objective of this research program is to develop an understanding of the computational principles emerging from the spatio-temporal dynamics of locally connected neurons and electronic devices. The ultimate goal is a new discipline (Synthetic Neuroscience) which uses electronics technology to assist in a quantitative understanding of the brain. This unit will support the development of biological neural network and system models. Theories will be investigated to analyze the dynamical behavior of systems consisting of locally-connected neurons simulated via electronic hardware. Architectures will be simulated and implemented in very large scale integrated devices and, ultimately, in arrays of quantum effect devices.

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ADAPTIVE CONTROL

This program aims to discover principles of adaptive, sensor-driven control in biological systems and apply them to the design and development of novel adaptive control schemes for robots in complex, unstructured environments. Of particular interest are sensor driven control of dexterous manipulation, tactile information processing for manipulation control and object recognition; the biomechanics and control of muscles relating to the design of muscle-like actuators, biomechanics, biohydrodynamics, and control of locomotion in fish and marine mammals, and sensor interpretation and world modeling for navigation

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IMAGE ANALYSIS

Image Analysis is an interdisciplinary program of basic research, involving neuroscience, psychophysics and/or computational analysis, aimed at development of the computational basis for machine sensor systems capable of processing either visible, infrared or millimeter band, electromagnetic band or acoustic energy to achieve accurate, robust target detection, classification and identification. Potential Navy payoffs include novel principles, algorithms and hardware implementations for automatic target recognition and for the guidance of robotic systems.

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BIOSONAR

Biosonar is a multidisciplinary program, involving neuroscience, psychoacoustics and computational analysis, aimed at a mechanistic understanding and technological exploitation of the capabilities of biosonar systems such as dolphins and bats to detect, classify and identify targets based on echo analysis. Potential Navy payoffs include automated active sonar systems incorporating principles and algorithms from biosonar for real-time target detection, localization, classification and identification in noise and clutter with low false alarm rates.

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COGNITIVE SCIENCE

The ONR Cognitive Science Program emphasizes computational modeling of the human learner and performer of complex skills, such as those required by Navy jobs. Computational theories of human cognitive architecture that provide a foundation for applications in both training and the design of effective human-computer interaction are its most central theme. It is a base program which also serves as an incubator for new research directions in cognitive science: other specialized programs listed here, such as intelligent computer-assisted instruction, hybrid learning and neuro-cognitive science are extensions developed from this base program.

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INTELLIGENT, COMPUTER-AIDED INSTRUCTION

This program supports research on open issues in artificially intelligent tutoring, notably questions about true natural language interaction for intelligent tutoring and also about effective instructional strategies. It also has a more applied emphasis on the development of authoring tools to facilitate the more cost-effective production of artificially intelligent instructional systems. It is a research program and will not support simple development of an instructional system for a particular application.

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HYBRID LEARNING

This program is exploring the potential of hybrid combinations of neural net and symbolic computing to more accurately represent human learning of complex skills such as tactical decision-making, to provide a foundation for both more effective training and the design of artificial systems to emulate human learning capabilities.

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NEURO-COGNITIVE SCIENCE

Neural systems analyses can provide important insights into the construction of computational models of human cognition relevant to intelligent training approaches and the design of human-machine interfaces and decision support systems. This program supports basic research into the component architectures underlying human problem-solving, decision-making and the acquisition of complex skills. Particular emphasis has been on the decomposition of working memory into distributed neural architectures with differing functional roles. Future investments will focus on spatial representation, practice effects and computational cognitive modeling that incorporates neural systems analyses.

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VIRTUAL ENVIRONMENT TRAINING TECHNOLOGIES

Virtual Environment Training Technologies can provide compact, deployable, affordable training systems that are reconfigurable in software for multiple training needs from flight simulation to ship-handling to maintenance and damage control. Virtual Environments are characterized by immersive, multi-modal displays that permit natural interaction with synthetic or remote environments. This program supports enabling human engineering research, testbed development, and training effectiveness studies relevant to Navy and Marine Corps requirements.

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SPATIAL ORIENTATION AND NAVIGATION IN LARGE-SCALE VIRTUAL SPACES

Virtual Environment (VE) systems are rapidly finding their way toward applications in Navy training and operations. This program addresses critical, practical and theoretical problems of spatial orientation and navigation inherent in immersive, large-scale VE displays by supporting basic and developmental research in the nature of spatial representations, navigational cueing, and interaction approaches for orientation, exploration and control.

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SPECIAL PROGRAMS DEPARTMENT

Two divisions of this department, Strike Technology and Corporate Programs, are described below. The division of Strike Technology manages technology programs in the areas of aeronautics, avionics, propulsion, ballistics, warheads, missile guidance, seekers, parallel distributed processing, and stealth technologies. It contributes in crucial ways to the evolution of aircraft, surface and air launched weapons, and advanced sensors. The division of Corporate Programs manages ONR's multidisciplinary educational and research infrastructure programs to increase the numbers and improve the capabilities of engineers and scientists working on issues of concern to the Navy now and in the future.

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Strike Technology Division

This division is structured into two major programs, weapons technology and aircraft technology. These programs directly support Navy S&T requirements for Joint Strike Warfare involving Air Superiority and Precision Attack, and Air and Surface Battlespace requirements of Joint Littoral Warfare involving Aircraft, Naval Surface Fire Support, and Ship Self Defense. In support of these mission area requirements, the division conducts exploratory and advanced development programs in the areas of aeronautics, avionics, air vehicle propulsion, missile solid and air breathing propulsion, gun propulsion, missile and gun projectile guidance and control, warheads, fuze and safe and arm devices, fire control and targeting.

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WEAPONS TECHNOLOGY

This program is involved with exploratory and advanced development focused on guidance and control for air and surface weapons, including seeker development, signal and image processing; ordnance technology including warheads, fuzing, safe and arm devices, and energetic materials; aero/structures including steady and unsteady aerodynamics associated with axi-and non-axisymetric missile air-frame shapes as well as the use of composite materials for missile structural components; propulsion technology including solid rocket propulsion and airbreathing propulsion for missiles as well as propulsion for gun-launched projectiles; fire control/targeting/mission planning for both air-launched and ship-launched weapons; systems investigations to perform performance trade-off studies leading to affordable technology investment strategies at the component level.

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AIRCRAFT TECHNOLOGY

The basis of this program is the determination of potential air threats and the development of necessary technologies to assure a counter threat capability to penetrate and survive enemy air-to-air and surface-to-air defenses. Improved operational effectiveness of air vehicles with increased stealth capability, range, speed, time-on-station, and carrier suitability are typical operational objectives. These technologies include at-sea supportability enhancements, aircraft engine efficiency, durability, maintainability and reliability improvements, low-risk insertion of advanced integrated modular avionics, and fully integrated, on-board mechanical diagnostics and vehicle health monitoring, displays to provide new mission and weapon aiming, reconfigurable flight control effectors, agile flight dynamics and aerodynamic shaping, smart, actively damped structural vibration peak eliminators and lightweight, affordable composite structures and technologies that reduce the signature of the aircraft.

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Corporate Programs Division

This division administers multidisciplinary research and education programs that support the ONR mission as a whole. In general, corporate programs increase the numbers of engineers and scientists engaged in efforts of concern to national defense while substantially improving their capabilities and potential for providing evolutionary and often revolutionary technological capabilities to the United States Navy and Marine Corps. Corporate Programs Division opportunities are cyclical. Potential participants are advised of two points: (1) the renewal of a given program is contingent upon continued availability of funds, and (2) the current requirements and conditions for most of these corporate programs are announced each year. Deadlines and other terms may be modified to reflect lessons learned and respond to current conditions. Programs administered by the division include:

- DoD National Defense Science and Engineering Graduate (NDSEG) Fellowship Program of the URI
- ONR Historically Black Colleges and Universities Graduate Fellowship Program
- Augmentation Awards for Science and Engineering Research Training (AASERT) of the URI
- Naval High School Science Awards Program
- High School Apprenticeship Program
- ONR Postdoctoral Fellowship Program
- Women Postdoctoral Science Scholars Program
- Young Investigator Program
- ONR Historically Black Engineering Colleges (HBEC) Future Faculty Fellowship Program
- Summer Faculty Research Program
- Faculty Sabbatical Leave Program
- Multidisciplinary Research Program of the URI (MURI)
- Defense University Research Instrumentation Program (DURIP) of the URI
- DoD Experimental Program to Stimulate Competitive Research (DEPSCoR) of the URI
- University Research Initiative Support Program (URISP)
- ONR Science and Technology Historically Black Colleges and Universities and Minority Institutions Council
- Foreign Field Offices

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DoD NATIONAL DEFENSE SCIENCE AND ENGINEERING GRADUATE (NDSEG) FELLOWSHIP PROGRAM OF THE URI

The following is a synopsis. Please see ONR's Home Page (see inside front cover for instructions) for detailed, current program information.

The NDSEG Fellowship Program is a joint program of the United States Army, Navy, Air Force, and the Advanced Research Projects Agency, within the University Research Initiative (URI), designed to increase the number of U.S. citizens trained in disciplines of science and engineering important to defense goals. DoD awards approximately 90 new three-year graduate fellowships each year to individuals for study and research leading to doctoral degrees in such disciplines as: aeronautical and astronautical engineering, biosciences; chemical engineering; chemistry; cognitive, neural, and behavioral sciences; computer science, electrical engineering; geosciences; manufacturing sciences and engineering; materials science and engineering; mathematics; mechanical engineering; naval architecture and ocean engineering; oceanography, and physics.

Materials: Descriptive materials and applications are available from, and completed applications must be returned to, Battelle, the program administrator, at the following address:

NDSEG Fellowship Program
ATTN Dr. George Outterson
200 Park Drive, Suite 211
P. O. Box 13444
Research Triangle Park, NC 27709-3444
919/549-8505

Eligibility: Applicants must be citizens or nationals of the United States who intend to pursue a PhD in the designated fields. The Fellowships are intended for students at or near the beginning of graduate study. Applications are especially encouraged from women, underrepresented minorities and persons with disabilities. NDSEG Fellows may enroll in any nonprofit United States institution of higher education offering a PhD degree in science or engineering. Fellows are eligible to participate in research at Navy laboratories during term breaks.

Tenure: The tenure of an NDSEG Fellowship is 36 months. Recipients of new three-year fellowships must begin tenure not later than the fall following award.

Stipends and Allowances: NDSEG Fellowship stipends for 1995 awards were $16,500 for the first year, $17,500 for the second year, and $18,500 for the third year. In addition to stipends, the DoD pays the Fellow's full tuition and required fees (not to include room and board). Persons with disabilities are considered for increased stipends to offset special educational expenses.

Evaluation and Selection: The evaluation of applicants is based on all available evidence of ability, as provided in the application. Each application is evaluated by a panel having expertise related to the science or engineering discipline of the applicant's proposed advanced degree program.

Conditions of Appointment: Fellows are required to enroll in full-time programs leading to graduate degrees in designated fields in order to pursue a PhD degree.

The availability of funds for the second and third years of a three-year award is contingent upon certification to DoD that the Fellow has made satisfactory academic progress.

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ONR Historically Black Colleges and Universities Graduate Fellowship Program (HBCU GFP)

The following is a synopsis. Please see ONR's Home Page (see inside front cover for instructions) for detailed, current program information.

The ONR HBCU GFP is specifically designed for graduates of Historically Black Colleges and Universities (HBCUs). The purpose of the program is to increase the diversity of students pursuing graduate careers in science and engineering disciplines of interest to the Navy. Disciplines may include: aerospace engineering; chemistry; cognitive and neural sciences; computer science; electrical engineering; manufacturing science and engineering; materials science; mathematics; mechanical engineering; naval architecture; ocean engineering; oceanography; physics.

Materials: Descriptive materials and applications may be obtained from, and applications must be returned to, Hampton University at the following address:

ONR HBCU Graduate Fellowship Program
Research Center for Optical Physics
Hampton University
Hampton, Virginia 23668
804/727-5153 or 800/254-2223

Eligibility: Eligibility for this program is restricted to students who are U.S. citizens or nationals. Students must be enrolled currently in one of the HBCUs and must receive an undergraduate or Master's degree from that institution by December of the year in which the award is made. Graduate Fellows must pursue a PhD in a designated discipline and attend any U.S. institution that offers the doctoral degree in the selected area of study. Fellows are eligible to participate in research at Navy laboratories during term breaks.

Fellows will be required to maintain full-time enrollment in the selected doctoral institution. Fellows will be required to submit verification of satisfactory performance, e.g., transcripts, to the program administrator each semester.

Stipends and Education Expense: ONR HBCU GFP awards will be made for a period of four years to post-baccalaureate students and for a period of two years to post-Master's students. Stipends for the 1995 competition were $16,500 the first year, $17,500 the second year, and $18,500 for the third and fourth years. Fellows who start at the post-Master's level will be eligible for only two years of stipends at $18,500 each year. Full tuition and required fees will be paid.

Mentoring Program: A mentoring program is a part of the ONR HBCU GFP. Each fellow is assigned a practicing professional to serve as a mentor, and the mentors are responsible for communicating with the students at least twice each semester in order to identify factors that might advance or hinder the fellow's educational progress.

Application and Selection Process: Fellowship applications will be reviewed and ranked by a panel of scientists and engineers. Competitive evaluations and rankings will be based on all available evidence of ability, as provided in the applications.

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AUGMENTATION AWARDS FOR SCIENCE AND ENGINEERING RESEARCH TRAINING (AASERT) OF THE URI

The following is a synopsis. Please see ONR's Home Page (see inside front cover for instructions) for detailed, current program information.

The AASERT program is a multi-agency DoD program within the University Research Initiative designed to increase the number of highly capable scientists and engineers educated as a part of DoD-sponsored research. AASERT supports the addition of one or two graduate students to the "parent" grant of a university researcher currently funded by DoD. The parent award provides a base of defense research funding, covering the fixed costs of the infrastructure in which the student is working. AASERT funding builds upon this base by supporting the work of one or two additional graduate students that the parent grant would not otherwise support.

Eligibility: All Principal Investigators at institutions of higher education with degree-granting programs in science or engineering with DoD research contracts or grants in effect on a given date (identified annually) are eligible to submit proposals for augmentation of these "parent" awards.

Students supported by AASERT must be U.S. citizens or nationals whose research is directly related to the investigator's DoD sponsored research. All proposers are encouraged to use AASERT funding to recruit students from groups historically underrepresented among U.S. citizens holding advanced degrees in science and engineering. Proposers may also make provisions for participation of undergraduate and precollege students in AASERT-funded research.

Proposal Evaluation Criteria: Proposals are competitively evaluated. Criteria for evaluation are cited annually.

Proposal Submission: Typically, information may include a brief text describing research activities in which AASERT students will participate, a one-page abstract of the research, and a breakdown of costs linked directly to the student(s).

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NAVAL HIGH SCHOOL SCIENCE AWARDS PROGRAM

The following is a synopsis. Please see ONR's Home Page (see inside front cover for instructions) for detailed, current program information.

The Naval High School Science Awards Program was established to encourage the interest of high school students in science and engineering, to reward their scientific achievements, and to encourage them to pursue careers in science or engineering.

Regional and State Fairs

The Navy and Marine Corps participate each year in more than 400 regional and state science and engineering fairs in which high school students exhibit their projects. Qualified experts drawn from local Navy and Marine Corps activities serve as judges and subsequently present prizes to successful competitors.

Junior Science and Humanities Symposia

High school students who win Navy and Marine

Corps awards in their regional/state fairs will be invited to submit a research paper to the regional Army-Navy Junior Science and Humanities Symposium in their area during the next academic year (for those regional/ state fair winners who are still high school students in the next academic year). These symposia are held on university campuses. Participants interact with and hear presentations by practicing scientists and engineers. Selected student participants make oral presentations of their research. Four students from each regional symposium are invited to attend the national JSH Symposium, held in May. A $4,000 scholarship is awarded at each of the regional symposia; these awardees then compete for additional scholarships (seven of $16,000 each and seven of $6,000 each) at the national symposium.

International Science and Engineering Fair

To expand the opportunity to recognize scientific and engineering excellence among the nation's youth, the Navy and Marine Corps competitively offer awards at the annual International Science and Engineering Fair (ISEF). The awards include $8,000 scholarships for college, payable at $2,000 a year, and prizes and certificates in each of ISEF's fifteen technical categories.

Eligibility: Naval Science Awards are limited to high school students who are citizens or nationals of the United States at the time of selection. The science or engineering project must be the individual's work, team efforts are not eligible.

Dates: Requests by fair directors for participation by the Navy and Marine Corps at regional/state fairs must be received by ONR by December 15.

Requests for Navy and Marine Corps participation in regional/state science and engineering fairs as well as questions about the symposia or ONR's role in the International Science and Engineering Fair may be directed to the following contact:

Ms. Barbara Thurman
Naval Science Awards Program
ONR 353, room 804
800 North Quincy Street
Arlington, Virginia 22217-5660
703/696-5787 or 800/422-6727
thurmab@onrhq.onr.navy.mil

HIGH SCHOOL APPRENTICESHIP PROGRAM

The following is a synopsis. Please see ONR's Home Page (see inside front cover for instructions) for detailed, current program information.

In the High School Apprenticeship Program, ONR supports high school students to work on research projects under the guidance of ONR Principal Investigators (PIs) at universities. This program seeks to encourage high school students to consider careers as scientists or engineers. ONR Principal Investigators with a strong commitment to serve as a mentor for high school students should discuss with their current ONR technical program monitor (Program Officer) possible augmentation of the grant to accommodate research by high school students. Students and PIs usually work together in the summer, but other arrangements (holiday breaks, one day a week, etc.) can be proposed.

Following discussion of arrangements, PIs must submit a formal proposal to the ONR program officer to expand their grant to include activities with high school students. Support is primarily for modest stipends for the students with nominal fees for computer time or materials; stipends are typically at or near the prevailing minimum wage. No charges are made for the Principal Investigator's time, and fees for indirect costs are generally waived by the university in a cost-sharing commitment. Students are recruited by the PI from local high schools in an application and interview process appropriate to the schools, the Principal Investigator, and the discipline. Participation by students from groups historically underrepresented in science and engineering is encouraged.

ONR investigators who are interested in participating in this program should contact the Program Officer who monitors their grant, not the Corporate Programs Division. ONR Program Officers can seek funding from Corporate Programs Division for augmentations that involve two or more high school students.

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ONR Postdoctoral Fellowship Program

The following is a synopsis. Please see ONR's Home Page (see inside front cover for instructions) for detailed, current program information.

ONR sponsors a Postdoctoral Fellowship Program at a number of Naval research and development centers and laboratories. The objective of this program is to encourage the involvement of creative, capable, and highly trained scientists and engineers from academia and industry in areas of great interest and relevance to the Navy. Participating Navy laboratories and centers include the following: Naval Air Warfare Center (Warminster, PA, China Lake, CA, Orlando, FL); Naval Command, Control and Ocean Surveillance Center (San Diego, CA); Naval Facilities Engineering Service Center (Port Hueneme, CA); Naval Postgraduate School (Monterey, CA); Naval Research Laboratory (Washington, DC, Stennis Space Center, MS; Monterey, CA); Naval Surface Warfare Center/Carderock (Bethesda, Annapolis, White Oak, MD); Naval Surface Warfare Center/Dahlgren (Dahlgren, VA; Panama City, FL; White Oak, MD); Naval Undersea Warfare Center/Newport (Newport, RI and New London, CT); Naval Medical Research and Development Command (Bethesda, MD); The Naval Medical Research Institute (NMRI) (Bethesda, MD), NMRI's Toxicology Detachment (Wright Patterson Air Base, Dayton, OH); The Naval Health Research Center (San Diego, CA), The Naval Aerospace Medical Research Laboratory (Pensacola, FL), The Naval Biodynamics Laboratory (New Orleans, LA), The Naval Submarine Medical Research Laboratory (Groton, CT), The Naval Dental Research Institute (Great Lakes, IL), Navy Personnel Research and Development Center (San Diego, CA), United States Naval Academy (Annapolis, MD)

The ONR Postdoctoral Fellowship Program provides approximately 40 new postdoctoral appointments per year The selected participants will work on site at Navy laboratories while interacting with senior naval research and development center/laboratory scientists and engineers

Materials: Descriptive materials and applications are available from, and applications should be returned to:

American Society for Engineering Education
Projects Office, Suite 600
1818 N. Street, NW
Washington, DC 20036-2479
202/331-3500

Selection of Participants: Fellowship awards will be based upon the technical quality and relevance of the proposed research, recommendations by the Navy laboratory/center, academic qualifications, letters of reference, and availability of funds. Selection of Fellows occurs four times per year; applicants who submit completed applications by January 1, April 1, July 1, or October 1, will be notified of awards by February 20, May 20, August 20, and November 20, respectively.

Awards: Awards are for one year, and are twice renewable for one year, given satisfactory performance and availability of funds.

Research Proposal: Prospective applicants must contact the research facility at which they are interested in working to jointly develop a suitable research proposal. Official Transcripts are required for each level (undergraduate, graduate, doctoral) of education.

Stipend: The fiscal year 1995 base (minimal experience) annual stipend for the first year was $36,000; higher amounts may be offered in certain fields and to participants having greater experience. Certain benefits are also payable to Fellows. Travel allowances are also considered.

Obligation to the Government: Fellows must devote full time to the approved research program and must be on-site at the sponsoring laboratory during the entire period of the award. No additional monetary aid or other remuneration may be accepted from another appointment, fellowship, or similar grant during the period of the award.

Eligibility: Participants selected for support under the ONR Postdoctoral Fellowship Program must be United States citizens or nationals. Participants must be eligible for a DoD security clearance of "Secret." In most cases, participants will be permitted to initiate research pending completion of the security clearance. All appointments are contingent upon Fellows obtaining and maintaining the appropriate level of security clearance.

Education and Experience: Before appointment, participants must present evidence of having received the PhD, ScD, or other earned doctoral degree (recognized as equivalent to the PhD) within seven years of the date of application, or must present acceptable evidence of having completed all formal academic requirements for one of these degrees before appointment and the expected graduation date.

There is a policy of not accepting the applications of those applicants with previous postdoctoral fellowships at Navy laboratories, but exceptions may be made on a case-by-case basis.

Post-Tenure Support: Post-tenure research awards of at least $50,000 for ONR Postdoctoral Fellows who accept faculty-level positions at U.S. academic institutions that award degrees in science and engineering will be made to those who successfully propose Navy-relevant research to ONR Program Officers. The possibility of receiving a research initiation grant at the beginning of an academic career is enhanced since ONR's Corporate Programs Division will cost-match the first $25,000 provided by an ONR Program Officer.

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WOMEN POSTDOCTORAL SCIENCE SCHOLARS PROGRAM

The following is a synopsis. Please see ONR's Home Page (see inside front cover for instructions) for detailed, current program information.

The Women Postdoctoral Science Scholars Program at the Mary Ingraham Bunting Institute of Radcliffe College encourages the research and teaching careers of women in science and engineering, who are at critical career points, by providing postdoctoral opportunities in an academic research setting. About eight women are selected annually for one-year appointments which generally involve collaborative efforts with neighboring research and teaching institutions (e.g., Harvard, MIT, Tufts, Boston University).

The program identifies and supports women who need the postdoctoral opportunity to expand credentials to effectively reenter or redirect technical career paths. Objectives are to increase the productivity and visibility of these women, to improve credentials for appointment, tenure, and/or promotion, and to help the participants achieve greater professional recognition.

Materials: Descriptive materials and applications can be obtained from, and should be returned to:

Fellowships Coordinator
The Mary Ingraham Bunting Institute
Radcliffe College
34 Concord Avenue
Cambridge, MA 02138
617/495-8212

Eligibility and Opportunity: Applicants to the Women Science Scholars program must be U.S. citizens or nationals who have held doctorates for at least two years prior to appointment in a science or engineering area within the broad scope of the ONR mission. Scholars will be chosen through a three-stage review process for which a project proposal, personal statement, list of publications, biographical information, and references are required. Selections are based on the quality of the proposed project and the contribution it will make to the field, relative career need (will the appointment make a critical difference in the applicant's career?), balance among disciplines important to the ONR mission, and credentials to date.

The one-year appointment includes: administrative support; a modest research allowance; physical space at Bunting Institute; a variety of mechanisms (colloquium series, careers forum, etc.) for exchanging information with Bunting Scholars; and stipend support ($34,200 in fiscal year 1995).

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YOUNG INVESTIGATOR PROGRAM

The following is a synopsis. Please see ONR's Home Page (see inside front cover for instructions) for detailed, current program information.

The objectives of the Young Investigator Program are to attract to naval research outstanding young university faculty members, to support their research, and to encourage their teaching and research careers. ONR makes approximately 28 new awards each year to academic researchers who have held PhD or equivalent degrees for fewer than five years.

Awards: Awards of $100,000 per year for three years (with the possibility of greater support for equipment or through matching funds for research support obtained from any other Navy organization) are made, based on research proposals and supporting materials. Special attention will be given to proposals in ONR priority research areas, which are listed annually.

Eligibility: This program is open to U.S. citizens, nationals, and permanent residents who hold tenure-track positions at U.S. universities and colleges and who have received graduate degrees (PhD or equivalent) within the preceding five years.

Application: Applicants must submit a research proposal and a supporting letter through the appropriate university officials. Strong university support for the applicant is essential. This support can be of several forms, for example: the applicant's nine-month academic year salary; release time from administrative responsibilities; the purchase of equipment; support for the applicant's graduate students; or waiver of indirect costs.

Those proposals not selected for Young Investigator awards are automatically considered for ONR's regular research grant program in competition with all other research proposals submitted to ONR

Selection and Evaluation: Applicants are selected competitively by the Office of Naval Research based on criteria set forth in the annual program announcement

Support: Each successful applicant receives a basic award of $100,000 per year for three years These funds may be budgeted against any reasonable costs related to the conduct of the Young Investigator's research, including salary, graduate student support, and supplies. Additional funds (beyond the basic $100,000 yearly amount) for equipment which enhances the Young Investigator's research may be requested for the first year, based on the needs of the research.

As an incentive for becoming involved with other Navy research activities, the Office of Naval Research will match on a 2-for-1 basis the first $25,000 of research support which a successful applicant obtains from Navy sources outside the Office of Naval Research. Thus, this matching funds clause can provide research support up to $75,000 per year above the basic $100,000 per year award. Other Navy support and matching funds can be arranged at any time and need not be in place at the time of the initial award.

Future Research Support: Upon completion of the three-year period, Young Investigators may apply to the appropriate ONR science and technology department for continued support. Decisions about continued funding outside the context of the Young Investigator Program are made following a review of the new proposal.

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ONR HISTORICALLY BLACK ENGINEERING COLLEGES (HBEC) FUTURE FACULTY FELLOWSHIP PROGRAM

The following is a synopsis. Please see ONR's Home Page (see inside front cover for instructions) for detailed, current program information.

This fellowship program is designed to develop and attract qualified engineering faculty to Historically Black Colleges and Universities (HBCUs) with engineering programs. Each year, three recipients who agree to join the engineering faculty of an HBCU are competitively selected for study and research leading to doctoral degrees in engineering. Disciplines may include: aerospace engineering, electrical engineering, mechanical engineering, manufacturing science and engineering, civil engineering, and ocean engineering.

Materials: Descriptive materials and applications are available from, and completed applications must be returned to, the program administrator at the following address

ONR HBEC Future Faculty Fellowship Program
c/o Harold L. Martin, Sr., PhD, PE, Program Director
North Carolina A&T State University
College of Engineering
651 McNair Hall
Greensboro, North Carolina 27411

Eligibility: Applicants must be citizens or nationals of the United States who intend to pursue a PhD in the designated fields and, in return for the support, agree to join the engineering faculty of an HBCU. The Fellowships are intended for students at or near the beginning of graduate study. Applications are especially encouraged from women, underrepresented minorities and persons with disabilities. ONR/HBEC Future Faculty Fellows may enroll in any nonprofit United States institution of higher education offering a PhD degree in engineering. Fellows are eligible to participate in research at Navy laboratories during term breaks.

Tenure: The tenure of an ONR/HBEC Future Faculty Fellowship is 36 months. Recipients of new three-year fellowships must begin tenure not later than the Fall following award.

Stipends and Allowances: ONR/HBEC Future Faculty Fellowship stipends for 1995 awards were $16,500 for the first year, $17,500 for the second year, and $18,500 for the third year. In addition to stipends, the program pays the Fellow's full tuition and fees (not to include room and board). Persons with disabilities are considered for increased stipends to offset special educational expenses.

Selection: Fellows will be recommended for selection annually by the Historically Black Engineering Colleges Committee (HBECC), which is a subcommittee of the American Society for Engineering Education (ASEE). Evaluations will be based upon the following information:

1. Academic Achievement
2. Area of Study
3. Personal Statement
4. Letters of Recommendation

Conditions of Appointment: Fellows are required to enroll in full-time programs leading to doctoral degrees in the designated fields. The availability of funds for the second and third years of a three-year award is contingent upon certification that the Fellow has made satisfactory academic progress.

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SUMMER FACULTY RESEARCH PROGRAM

The following is a synopsis. Please see ONR's Home Page (see inside front cover for instructions) for detailed, current program information.

The Summer Faculty Research Program provides science and engineering faculty members from institutions of higher education the opportunity to participate in research at Navy laboratories for 10 weeks during the summer. Participants work with professional peers on research tasks of mutual interest. The research is defined in advance through correspondence and, if appropriate, a pre-program visit to the research site by the faculty member.

Materials: Descriptive materials and applications are available from, and must be returned to:

American Society for Engineering Education
Projects Office, Suite 600
1818 N. Street NW
Washington, DC 20036-2479
202/331-3500.

Institutions participating in the Summer Faculty Research Program include the following: Naval Research Laboratory, Washington, DC; Orlando, FL; and Stennis Space Center, MS; Naval Medical Research Institute, Bethesda, MD; Naval Surface Warfare Center, Carderock, MD; Silver Spring, MD; Annapolis, MD; Dahlgren, VA; and Panama City, FL; Naval Undersea Warfare Center, Newport, RI and New London, CT; Naval Submarine Medical Research Laboratory, Groton, CT; Naval Air Warfare Center, Warminster, PA and China Lake, CA; Naval Aerospace Medical Research Laboratory, Pensacola, FL; Naval Air Warfare Center, Training Systems Division, Orlando, FL; Defense Equal Opportunity Management Institute, Cocoa Beach, FL; Naval Biodynamics Laboratory, New Orleans, LA; Naval Command & Control and Ocean Surveillance Center, RDT&E Division, San Diego, CA; Naval Facilities Civil Engineering Service Center, Port Hueneme, CA; Naval Personnel R&D Center, San Diego, CA; Naval Health Research Center, San Diego, CA.

Objectives: The objectives of the Summer Faculty Research Program are to engage university faculty members in the research programs of the Navy's research and development laboratories and to develop the basis for continuing research of interest to the Navy at the faculty members' institutions. Laboratory, computational, library, and specialized facilities not available at some universities and colleges can be used to conduct research which might otherwise be impossible.

Levels-of-Appointment: Three levels of appointments are available: Summer Faculty Fellow, Senior Summer Faculty Fellow, and Distinguished Summer Faculty Fellow. For all appointments the applicant must be a U.S. citizen or national and hold a teaching or research faculty position at a U.S. institution of higher education. To qualify for appointment as a Senior Summer Faculty Fellow, the applicant must have at least five years of research experience in his/her field of expertise since earning a PhD or equivalent degree and must present a substantial and significant documented record of research accomplishments and publications, particularly in refereed journals and books. A limited number of appointments as a Distinguished Summer Faculty Fellow are available for faculty members who are preeminent in their field of research, e.g., hold a senior appointment at a leading research university and are internationally recognized for their research achievements. Levels will be determined by a committee of scientists and engineers. Decisions of the committee will be final.

Allowances: For 1995, stipends were $1,150 per week at the Summer Faculty Fellow level, $1,400 per week at the Senior Summer Faculty Fellow level, and $1,650 per week at the Distinguished Summer Faculty Fellow level. In addition, each Fellow can be reimbursed for his/her personal travel for an optional pre-program visit to the research site. For Fellows who relocate for the summer appointment, a similar travel and modest relocation allowance will be provided.

Security Requirements: Although it is anticipated that the research undertaken will be unclassified, participants must be U.S. citizens either holding, or eligible for, a DoD security clearance of SECRET to facilitate access to facilities.

Period of Appointment: Appointments are for ten contiguous weeks beginning during May or June; the starting date is selected by agreement between the Navy and the Fellow.

Housing: Housing availability and cost vary from center to center. The pre-program visit provides a good opportunity to seek housing. Navy host personnel often can assist.

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FACULTY SABBATICAL LEAVE PROGRAM

The following is a synopsis. Please see ONR's Home Page (see inside front cover for instructions) for detailed, current program information.

The Faculty Sabbatical Leave Program provides science and engineering faculty the opportunity to conduct research at Navy laboratories while on sabbatical leave.

Materials: Applications will be accepted at any time throughout the year; they will be reviewed and the applicant notified of outcome within 90 days of receipt of application. Descriptive materials and application forms for the Sabbatical Leave Program are available from, and must be submitted to:

American Society for Engineering Education
Projects Office
1818 N. Street, NW, Suite 600
Washington, DC 20036-2479
202 331-3500

Terms of Appointment: Appointments shall be for at least one semester and a maximum of one year. Participants in the Sabbatical Leave Program will receive a monthly stipend making up the difference between their regular salary and sabbatical leave compensation from their home institution. In addition, participants will receive reimbursement for travel to and from the laboratory site and a relocation allowance for those who must relocate their residence during their sabbatical leave tenure. Appointments are contingent on the availability of Sabbatical Leave positions and associated funding.

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MULTIDISCIPLINARY RESEARCH PROGRAM OF THE URI (MURI)

The following is a synopsis. Please see ONR's Home Page (see inside front cover for instructions) for detailed, current program information.

The Multidisciplinary Research Program of the University Research Initiative (MURI) is a multi-agency DoD program that supports research teams whose efforts intersect more than one traditional science and engineering discipline. Multidisciplinary team effort can accelerate research progress in areas particularly suited to this approach. Multidisciplinary research also can help to hasten the transition of research findings to practical application.

Awards: MURI awards are made in research areas specified by the participating defense agencies each year that the program is in force. Awards recently have been: for a basic period of three years (funded incrementally or as options) with two additional years possible as options to bring the total award to a possible five-year award; in the range of about $1 million to $3 million per year, with the size of the award dependent upon the topic, technical goals, and availability of appropriations.

Conditions: The MURI is competed in specific research topics described in the current announcement Potential proposers are advised to read the announcement carefully. It explains the agencies' research needs upon which the topics are based Proposals may be submitted only by U.S. institutions of higher education (other than those that are federal government organizations) with degree granting programs in science or engineering, or by consortia led by such institutions (universities).

Proposals from consortia of academic institutions may be warranted because research in the multidisciplinary topics may require forming teams with strengths in multiple science and engineering fields. One academic institution will be the primary awardee for purposes of award execution

The DoD expects that MURI programs will promote application of defense research, principally for defense purposes but also for commercial purposes. The research topics described in the MURI announcement generally underpin dual use defense technologies that are critical to national defense and that also have good potential for commercial application. Subawards to industrial organizations are permitted. However, consistent with the principal goals of the University Research Initiative, it is anticipated that award funds will remain vested substantially with the university(ies). Cost sharing by industrial participants is encouraged as a preferred means to achieving university-industry collaboration.

Federal laboratories, Federally Funded Research and Development Centers, academic institutions that are federal government organizations, and (non-academic) nonprofit organizations may participate in the proposed MURI effort. However, they may not receive funds awarded through MURI competitions.

Evaluation Criteria: Proposals are evaluated competitively. Evaluation criteria are cited in the current program announcement.

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DEFENSE UNIVERSITY RESEARCH INSTRUMENTATION PROGRAM (DURIP) OF THE URI

The following is a synopsis. Please see ONR's Home Page (see inside front cover for instructions) for detailed, current program information.

DURIP is a multi-agency DoD program within the University Research Initiative designed to improve the capabilities of U.S. institutions of higher education to conduct research and to educate scientists and engineers in areas important to national defense by providing funds for the acquisition of research equipment.

Areas of Interest: Each year that DURIP is in effect, research areas of interest to the sponsoring agencies for that fiscal year's competition are described in the announcement. Proposals to purchase instrumentation in support of research in these technical areas will be considered. Potential proposers should contact the appropriate program managers, listed under each topic, to explore possible mutual interests before submitting proposals.

Conditions: Proposals are sought for instrumentation, usually in the $50,000 to $1,000,000 range. Cost sharing is encouraged. DURIP funds will be used for the acquisition of major equipment to augment current or develop new research capabilities in support of DoD-relevant research. Proposals for purely instructional equipment are not eligible. General-purpose computing facilities are not appropriate for DURIP funding, but requests for computers for DoD-relevant research programs are appropriate. Funds under DURIP will not be used for construction, including building, or facilities modification. Lastly, set-up costs may be proposed, but costs for continued operation and maintenance are not eligible for consideration.

This competition is open to U.S. institutions of higher education, other than those that are a federal government organization, with degree granting programs in science or engineering.

Proposal Evaluation and Selection: Proposals are evaluated competitively. The evaluation criteria are defined in the current program announcement.

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DoD EXPERIMENTAL PROGRAM TO STIMULATE COMPETITIVE RESEARCH (DEPSCoR) OF THE URI

The following is a synopsis. Please see ONR's Home Page (see inside front cover for instructions) for detailed, current program information.

The Office of Naval Research participates in DEPSCoR within the University Research Initiative. The program is conducted with the cooperation of the Experimental Program to Stimulate Competitive Research State Committees.

DEPSCoR responds to Congressional requirements to stimulate competitive research in states that have not traditionally been recipients of a large amount of Federal research awards. DEPSCoR is designed to improve the capabilities of U.S. institutions of higher education in 18 states and Puerto Rico, as listed below. Under this program, university research grants will be made via EPSCoR State Committees which will have submitted proposals to the Government evaluation panels. Proposals not submitted through an EPSCoR State Committee will be rejected. Only U.S. institutions of higher education with degree granting programs in science, mathematics, or engineering are eligible for DEPSCoR grants.

List of eligible DEPSCoR States and Territories:

Alabama
Arkansas
Idaho
Kansas
Kentucky
Louisiana
Maine
Mississippi
Montana
Nebraska
Nevada
North Dakota
Oklahoma
Puerto Rico
South Carolina
South Dakota
Vermont
West Virginia
Wyoming

DEPSCoR funds may be used to develop new research capabilities in support of DoD research goals. Proposals may contain requests for equipment necessary for the completion of the proposed research. General purpose computing facilities and purely instructional equipment are not appropriate for DEPSCoR funding, but requests for funding for specialized computers entirely devoted to specific DEPSCoR research programs are appropriate. Funds under DEPSCoR may not be used for buildings or facilities modification.

Proposals are evaluated competitively. The evaluation criteria are described in the current program information.

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UNIVERSITY RESEARCH INITIATIVE SUPPORT PROGRAM (URISP)

The following is a synopsis. Please see ONR's Home Page (see inside front cover for instructions) for detailed, current program information.

URISP is a multi-agency DoD program that is designed to help build the research infrastructure in the fields of science, engineering, and mathematics that are important to DoD, at eligible academic institutions through the use of competitive, multi-year grants.

To be considered eligible, an institution must have an accredited degree granting program in science, mathematics, or engineering (SME), meet the definition of the term "Institution of Higher Education" in Title 20, United States Code, not be a federal government organization, and have received less than a sum of $2 million in grant and contract awards from DoD over the previous two fiscal years.

URISP support can be used to improve a single academic SME department by supporting the research of multiple investigators or may be used to support research of multiple academic SME departments that are fully integrated to address one focused technical issue. A URISP grant may lead to a research center of excellence. A substantial portion of the award can be used to purchase research equipment and instrumentation needed to perform the proposed research and for refurbishment of lab facilities in support of the proposed research; however, no new buildings or additions are permitted.

The proposal submission process is in two stages. First, white papers are sought from prospective proposers. Based on the evaluation of those white papers, selected proposers will be invited to submit more detailed proposals. Only one white paper and one proposal per eligible institution will be accepted.

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ONR SCIENCE AND TECHNOLOGY HISTORICALLY BLACK COLLEGES AND UNIVERSITIES AND MINORITY INSTITUTIONS COUNCIL

The following is a synopsis. Please see ONR's Home Page (see inside front cover for instructions) for detailed, current program information.

The ONR Science and Technology Historically Black Colleges and Universities and Minority Institutions (HBCU/MI) Council is an officially established ONR council whose primary purpose is to facilitate interactions between HBCU/MIs and ONR which may lead to greater HBCU/MI participation in ONR programs. The science and technology divisions of ONR and the Naval Research Laboratory are represented by members on the HBCU/MI Council. Inquirers seeking information on possible support for research should contact a Council member based on the science and technology area of interest.

The objectives of this Council are:

•To foster support of meritorious research proposals originating at HBCU/MIs.

•To assist HBCU/MIs in strengthening their capability to conduct quality research of interest to ONR.

•To assist in the development of science and engineering education programs geared to increasing the participation of underrepresented minorities in research and development areas of interest to ONR

•To coordinate the ONR HBCU/MI Program with similar programs in other Federal agencies.

To accomplish these objectives, the HBCU/MI Council members plan, develop, and implement mechanisms for increasing ONR Program Officer awareness of HBCU/MI research capabilities on the one hand, and HBCU/MI awareness of ONR goals and research priorities on the other. To foster this awareness, HBCU/MI Council members visit HBCU/MI campuses to increase ONR interaction therewith and to establish points of contact; plan, organize, and conduct meetings, seminars, or symposia as appropriate to maximize interactions between ONR and these institutions; serve as points of contact for HBCU/MI representatives requesting information on ONR and solicit HBCU/MI participation in ONR-supported programs such as the ONR HBCU/MI Educational Program, the Future Faculty Engineering/Program, the DoD University Research Initiative and Infrastructure Support Programs, Summer Faculty Research Program, and the High School Apprenticeship Program. Furthermore, the HBCU/MI Council members interact with their counterparts at other Federal agencies and with representatives of the White House Initiative on HBCUs to effect a coordinated, cohesive effort to bring together qualified HBCU/MIs and appropriate Federal sponsors.

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Points-of-Contact:

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Ocean, Atmosphere and Space Sensing and Systems Division
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Vice-Chair
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Cognitive and Neural S&T Division
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Industrial Programs Department
Dr. David Moran
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Naval Research Laboratory
Dr. Bruce Gaber
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FOREIGN FIELD OFFICES

The Chief of Naval Research maintains two foreign field offices: Office of Naval Research European Office (ONREUR) in London, and Office of Naval Research Asian Office (ONRASIA) in Tokyo.

In carrying out its mission to keep the American scientific community informed of progress in foreign science and technology, ONR's foreign offices establish and maintain liaison with scientific research and development agencies throughout the world, seek out and report accomplishments and trends in research, and evaluate implications and possible applications to U.S. research programs. To these ends, the offices emphasize several activities, including identification of new directions in research of potential interest to the Navy; monitoring progress for technical areas closely aligned with ongoing and planned research programs of the Navy; interpretive reporting of current and planned science and technology programs of importance (or potential importance) to the Navy; assessments of foreign science and technology in comparison to related work in the United States; identification of new directions for foreign science and technology efforts as well as identifying upcoming leaders and investigators abroad in technical areas of significance to the Navy; representing the Chief of Naval Research in various international bilateral, multilateral and NATO cooperative research, development, technology, and engineering (RDT&E) programs and scientific and technical information exchange programs; and active cooperation with other U.S. government science and technology organizations (as resources permit).

ONREUR is headed by a Commanding Officer and a Scientific Director. Technical staff consists of three civilian scientists/engineers, typically from academic or naval laboratories, and one military officer. ONRASIA is comprised of a civilian Technical Director with three civilian scientists/ engineers drawn from the same sectors as for ONREUR. Support staffs serve each office. Civilian appointments are typically for two years, with candidates identified from various technical disciplines, depending on current Navy science and technology requirements. In addition, several short-term focused assessors are identified by ONR Program Officers each year to conduct studies of 12 months or less. The ONRHQ foreign office point of contact manages the recruitment process to fill these positions. All scientific personnel for these offices must have a current awareness on an international scale of their technical areas, including the content of relevant U.S. Navy programs. These scientists and engineers are charged to pursue liaison activities (as described above) primarily where science and technology is done, i.e., by visiting foreign research laboratories, centers and institutes. Staff scientists/engineers are charged with reporting their findings directly via e-mail to their ONRHQ sponsors, and also make available their reports on the Internet at the addresses given below. In addition to these reports, co-located Air Force and Army scientists and technologists also compile their reports into a common database maintained by each office, accessible via the Internet.

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e-mail: mcclusw@onrhq.onr.navy.mil
Net: http://www.onr.navy.mil/

The foreign field offices may be contacted at the following addresses:

Commanding Officer
Office of Naval Research
European Office
PSC 802 Box 39
FPO AE 09499-0700
Phone: 44-171-514-4516
Fax: 44-171-514-4924
e-mail: jsilva@onreur.navy.mil
Net: http://www.ehis.navy.mil/homepage.htm

Director
Office of Naval Research
Asian Office
Unit 45002
APO AP 96337
Phone: 81-33-401-8924
Fax: 81-33-403-9670
e-mail: rehn@pinet.aip.org
Net: http://www.itd.nrl.navy.mil/ONRA/

INDUSTRIAL PROGRAMS DEPARTMENT

Because affordability is a top priority for the Navy and Marine Corps, ONR's integrated science and technology program interests include consideration of the manufacturing methods used to build naval warfighting systems. With affordability and the delivery of quality naval combat technologies in mind, ONR's Industrial Programs Department stimulates advantageous government-industry partnerships and promotes development in Fleet-supporting manufacturing of innovative, cost-efficient, and cost-reducing processes.

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Manufacturing Science and Technology (MANTECH) Division

The Department of the Navy emphasizes the potential for reducing risk inherent in the transition from research and development to production as the primary consideration of specialized Centers of Excellence, descriptions of which follow. For a closer look at the full range of Navy MANTECH projects, the Department of the Navy annually produces a *Manufacturing Science and Technology Project Book* listing close to 120 projects, most of which are conducted through the Centers of Excellence (the volume is available through the contacts listed below)

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Mr. Bill Safier
Naval Industrial Resources Support Activity
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CAST DUCTILE IRON

The Cast Ductile Iron project seeks to apply advanced casting techniques for ductile iron to products normally associated with heavier and more costly products such as projectiles and bombs. The project has developed a casting model to be used on projectiles from 76mm to 5in. The project is continuing efforts in the MK 82 Bomb Program to certify cast ductile iron as an acceptable material for use in bomb fabrication and to further develop cast ductile iron technology.

COOPERATIVE ENGAGEMENT CAPABILITY: TRANSMIT AND RECEIVE (T/R) MODULES (MULTI-FUNCTION SELF-ALIGNED GATE)

The objective of this program is manufacturing process optimization and cost reduction for next-generation T/R modules for both airborne and shipboard radar and communications systems. The project has developed a Cost/Yield model based on the main cost drivers in the fabrication of current T/R modules, and the results are being used to design and implement process technology improvements in GaAs wafer fabrication, module assembly, and testing.

ELECTRONICS MANUFACTURING PRODUCTIVITY FACILITY (EMPF)

EMPF areas of endeavor include electronics design, assembly, test, inspection, and rework with emphasis on the evaluation of electronics manufacturing equipment, processes, and materials. Current efforts include cleanliness testing at 12 mil pitch surface mount devices, fluxless soldering demonstration and deployment, process hardening of conformal coatings with low VOC materials, conformal coating dye tag standard development, process development for rework and repair at 12 mil pitch, and reflow/curing at 12 mil pitch. In addition, EMPF provides a teaching factory which offers skill and technical courses, seminars, and workshops.

FIBER-OPTIC ACOUSTIC SENSORS

Program projects include the development of a hydrophone winding station, a hydrophone optical assembly station, and a towed array station. Development of the technology supports objectives in naval defense, oceanography, and marine biology.

GULF COAST REGION MARITIME TECHNOLOGY CENTER (GCRMTC)

GCRMTC supports the design and manufacture of the following: power transmission systems, including gears, transmissions and cargo winches; ship hulls, including coastal shipping hulls; and electrical systems, including generators, power distribution networks, and fiber optic transmission. The program directly supports ship owners and operators, shipyards, component manufacturers, design agents, and academic institutions in the Gulf Coast area of the United States.

LIFE-CYCLE IN-SERVICE (LINC) REPAIR NETWORK

The LINC project is devoted to the development and implementation of advanced repair technologies at Naval aviation depots and shipyards. Current efforts include development and implementation of the following: a technology resource network for shipyards and depots; environmental state-of-practice reports and follow-on of recommended and prioritized environmental compliance programs, and an electrical interconnect screening system with potential application throughout DoD and private industry.

MANUFACTURING SYSTEMS DEVELOPMENT

Efforts in this program are organized in three major areas: Manufacturing Systems (i.e., activities in factory engineering, particularly with respect to establishing integrated engineering systems for process, factory, and enterprise design and the development of tools for evaluating the producibility of mechanical parts using feature-based design inputs); Precision Machining (this includes the development of an enhanced machine controller that will develop open architecture machine controllers); Pilot Demonstrations (e.g., transitioning advanced technology from the research facility program to commercial manufacturers, including precision machining, reverse engineering cells, and integrated workstations for computer-aided manufacturing systems engineering).

BEST MANUFACTURING PRACTICES CENTER OF EXCELLENCE (BMPCOE)

BMPCOE promotes technology transfer to solve common problems faced by U.S. firms in both commercial and defense sectors. The project has developed and continues to upgrade and maintain the Program Manager's Workstation, which has been designated by the Department of the Navy as its system for standard acquisition management. In addition the center provides training and related seminars and workshops, research, customer service and user group management and development.

ENERGETICS MATERIALS TECHNOLOGY CENTER (EXPLOSIVES AND PROPELLANTS)

The center concentrates efforts in two major areas: Process Technology and Environmental Technology. Project themes in Process Technology include: the development of process controls for improving process analysis and data collection with the goal of decreasing product variability and increasing production yields; pioneering manufacturing techniques for developing new methods of manufacturing energetic materials with an emphasis on continuous processing techniques; and improving process analysis for reducing cycle times, improving quality, and minimizing variability. Projects in Environmental Technology focus on pollution prevention, environmental compliance, and reclamation and recycling efforts.

CENTER OF EXCELLENCE FOR COMPOSITES MANUFACTURING TECHNOLOGY (CECMT)

CECMT represents a collaborative effort among industry, academic, and government organizations to develop, evaluate, demonstrate, and test composites manufacturing technologies. Current efforts include the following: a survey of existing repair procedures and existing Non-Destructive Item procedures for the Field Repair and Non-Destructive Evaluation of Low Observable Structures; Low Observable Core Manufacturing Process with implementation and testing; design and analysis of a composite mine countermeasures ship rudder for the Composite Marine Control Surface Program and material testing; infrared spectroscopy; cooperative senior project to construct a solar-powered boat with students from Marquette University under the Composites Technology Center initiative; a composite shipbuilding project.

NATIONAL CENTER FOR EXCELLENCE IN METALWORKING TECHNOLOGY (NCEMT)

The principal goal of the center's activities is to help naval and defense contractors improve manufacturing productivity and product reliability through the support of research, development, deployment, training, and education programs associated with advanced metalworking technologies. To achieve this goal, NCEMT has developed state-of-the-art capabilities in advanced materials testing, process modeling, component design, concurrent engineering, and systems technology.

MANUFACTURING SCIENCE AND ADVANCED MATERIALS PROCESSING INSTITUTE

The Manufacturing Science and Advanced Materials Processing Institute provides a focal point for the development and transfer of new manufacturing processes and equipment in a cooperative environment with industry, academia, other Navy Centers, and other laboratories to support weapons system development, acquisition, and in-service use. The Institute is composed of the National Center for Advanced Drive Train Manufacturing, the Navy Laser Center, and the Surface Engineering Center. It serves as a corporate residence of expertise in gear and power transmission systems, laser processing, laser assisted manufacturing, advanced materials processing, and advanced processes for material surface modification. A description of the research conducted by each division follows.

National Center for Advanced Drive Train Manufacturing (NCADT)

NCADT, a cooperative effort with the National Institute of Standards and Technology and the Department of Energy's Oak Ridge Facilities, exists to enable a collaborative total quality measurement capability that optimizes domestic, quality assured, precision gear metrology and manufacturing services for industrial, academic, and government participants. It provides the following: a calibration service for gear artifacts and master gears; advanced gear measurement techniques and mechanisms for achieving traceability of measurements, training and education of the gear industry in proper integration of metrology in gear manufacture as well as in specific measurement techniques, development and advancement of gear standards for gear metrology; and the development of a formal laboratory accreditation program for gear-related measurement.

Navy Laser Center

The Navy's Laser Center implements mature laser processes in naval facilities and others operated by government contractors. Process development and qualification efforts continue in laser-based repair, refurbishment of nickel aluminum bronze structures, lightweight structures and cladding, the development of procedures for laser-based coating and paint removal, the development of cladding alloys, and the pioneering of procedures for environmentally compliant coatings.

Surface Engineering

Material categories addressed by the center include electronic and optoelectronic materials, polymers, metals, ceramics, and diamond films. Films, coatings, and surface treatments are being developed to achieve wear, corrosion, and thermal resistance for mechanical systems such as machine elements, tools, engine components, thermal systems, and control surfaces. Also addressed are research and technology developments in the manufacturing of diamond and related coatings, nano devices, ion implantation systems, surface modification of composite constituents, physical vapor deposition, chemical vapor deposition, plasma deposition, and spray metal forming.

Industrial Outreach Division

ONR's Industrial Outreach Division develops full associations with industry to improve naval science and technology and meet the mission and warfighting requirements of the United States Navy and Marine Corps. The division's responsibilities include management of Cooperative Research and Development Agreements, a Science and Technical Information Program, a Domestic Technology Transfer Program, the Navy Small Business Innovation Research Program, and other industrial projects for the Department of the Navy.

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COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENTS

Through Cooperative Research and Development Agreements (CRADA's), ONR supports federal laboratories and partners in academia, local and state governments, and private industry who conduct joint efforts to their mutual benefit. Although such efforts generally involve federally developed technology or unique federal facilities, the federal government does not fund partners in CRADA arrangements, but partners may provide technical personnel, services, facilities, equipment, and other resources. Payoffs include the development of commercial products by non-federal partners and heightened states-of-the-art in naval science and technology on both sides of the table.

Recently administered CRADA's involve the testing of a simulated warfare computer network using high-capacity voice, video, and data links; the chemical reduction of explosives and propellants to components with commercial and DoD recycle value; and the development of a "Smartbouy" to boost situational awareness in combat through its multiple functions as an aid in navigation, surveillance, and marine traffic control. ONR currently manages about 250 CRADA partnerships.

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NAVY SCIENCE AND TECHNICAL INFORMATION PROGRAM (STIP)

The Navy Scientific and Technical Information Program (STIP) ensures timely and effective exchange of Navy research, development, test and evaluation efforts among DoD performers and managers. This exchange is accomplished through participation in the scientific databases maintained by the Defense Technical Information Center.

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DOMESTIC TECHNOLOGY TRANSFER PROGRAM

The Navy Domestic Technology Transfer (DTT) effort focuses on sharing federally-funded technological advancements with industry, where they can be commercialized to meet naval needs while strengthening the national industrial base. Two of the major mechanisms employed are the licensing of Department of the Navy patents and Cooperative Research and Development Agreements (CRADAs). Licensing takes advantage of mature technologies while CRADAs allow for joint research efforts and the sharing of resources. As part of its DTT program, Department of the Navy outreach efforts in advertising and trade shows disseminate information on naval technologies available for transfer.

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SMALL BUSINESS INNOVATION RESEARCH PROGRAM

Through the Department of the Navy's Small Business Innovation Research (SBIR) Program, small businesses have the opportunity to address naval needs in more than 30 science and technology areas. SBIR provides the Fleet with innovative advances in technology developed by small firms that have the courage, drive, and flexibility to assume risks, develop niches, and generally compete in areas less attractive to larger firms. SBIR participants benefit both from program awards as well as the further development and commercialization of the resulting products. In addition, an SBIR Technology Transfer Program is in place to support through small firms the conversion to commercial use of technologies that have their roots in Fleet operations and associated naval laboratories. Application-containing appendices associated with the solicitation are available for downloading from the World Wide Web at http://web.fie.com/web/fed/onr/down/onrdn013.htm.

Related programs include the Department of the Navy's Small Business Science and Technology Transfer Pilot Program (STTR), Navy SBIR Technology Transfer Program, and the ONR SBIR Program. To register on the DoD SBIR solicitation and related mailing lists, call 1-800-DoD-SBIR.

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NAVY SMALL BUSINESS TECHNOLOGY TRANSFER PILOT PROGRAM (STTR)

This pilot mission-oriented science and technology program (fiscal years 1994, 1995, and 1996) seeks to produce commercializable products through scientific research areas. The program requires that small businesses and nonprofit research institutions submit a joint proposal responsive to broad topics defined in the Department of the Navy's section of the annual DoD

STTR solicitation. Unlike the Navy's SBIR program, the STTR program focuses on a different science or technology area each year.

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NAVY SBIR TECHNOLOGY TRANSFER PROGRAM

This mission-oriented technology transfer program seeks to commercialize technologies that have roots in naval laboratories or other naval activities. Topics are identified in an annual DoD solicitation.

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ONR SBIR PROGRAM

This program is an integral part of the Navy SBIR program. It addresses the science and technology areas that define ONR's mission and organize its departments. ONR's topics are published under the Department of the Navy's section of the DoD SBIR Program solicitation, available from the Defense Technical Information Center at 1-800-DoD-SBIR

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CONTRACT AND GRANT AWARDS

Research may be supported by ONR through the use of a grant or a contract. Grants are generally made only to nonprofit institutions of higher education or to nonprofit organizations whose primary purpose is the conduct of scientific research. Contracts are used with both nonprofit and commercial organizations.

ONR GRANTS

The ONR grant is a written agreement executed by the government (grantor) and accepted by the institution (grantee). The grant document will contain an attachment with grantor terms and conditions (standard ONR Grant General Terms and Conditions are to be found in this volume on page 63). Participants in the Federal Demonstration Project will receive the terms and conditions specific to those institutions. Each grantee is expected to maintain accounting records in accordance with generally accepted accounting practices, which will permit determination that the funds were used for the purpose for which the grant was made. ONR grants require the grantee, upon completion of the grant, to furnish to the government a financial statement showing a breakdown of expenditures made in the performance of the grant. Payments under grants with educational institutions may be made by electronic funds transfer. These payments are managed by ONR Resident Representatives located at universities across the nation.

ONR CONTRACTS

ONR contract procedures are subject to the requirements of the Federal Acquisition Regulation (FAR) and the DoD FAR Supplement (DFARS). The selection of the type of contract, either cost or fixed-price, is based on various factors, such as the type of research to be performed and the contractor's experience in maintaining cost records. Cost-plus-fixed-fee contracts are used in appropriate cases with commercial contractors. Fixed-price contracts are used when the research project costs can be estimated accurately, the services to be rendered are reasonably definite, and the amount of government furnished property, if any, is fixed.

Points-of-contact (POC's) for business issues involving ONR's science and technology departments are as follows:

Industrial Programs Department
Special Programs Department
LeeAnn Boyer
boyerl@onrhq.onr.navy.mil

Information, Electronics, and Surveillance Science and Technology Department
Lambert C. McCullough
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Ocean, Atmosphere, and Space Science and Technology Department
Engineering, Materials, and Physical Science and Technology Department
Anna Mae Weston
westona@onrhq.onr.navy.mil

Personnel Optimization and Biomolecular Science and Technology Department
Terry Young
youngt@onrhq.onr.navy.mil

All of the above may be reached by telephone at 703/696-4513.

INVENTIONS AND PATENTS

Research sponsored by ONR often results in inventions. Rights to these inventions are determined by the terms and conditions of the particular patent rights clause included in the grant or contract. It is important that the government and the grantee or contractor know and exercise their rights to ensure the expeditious availability of the inventions to the public, to enable the government and the public to avoid unnecessary payment of royalties, and to defend against claims and suits for patent infringement.

REPORTS POLICY

A basic tenet of ONR is that an investigation is not complete until the investigator has reported the results in all necessary detail. Primary distribution of the report is normally made by the investigator. Copies of reports are furnished by the investigator to a prescribed list of addressees (as set forth in the original contract or grant) which includes the Defense Technical Information Center (DTIC). All unclassified, unlimited reports are accessioned by DTIC and released in bibliographic form to the National Technical Information Service (NTIS) to abstract for announcement in the subscription journal, *U.S. Government Reports Announcements*. Inquiries on NTIS services may be directed to NTIS, 5285 Port Royal Road, Springfield, VA 22161 (703/487-4650). Services include providing technical reports, bibliographies, subject searches, resumes of active research and development efforts, and other products. Both DTIC and NTIS maintain sites on the World Wide Web: DTIC's homepage address is http://www.dtic.dla.mil/ and the one for NTIS is http://www.fedworld.gov/preview/preview.html.

Mr. Dennis E. Padilla
Department Head
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HOW TO SUBMIT A PROPOSAL

Although ONR has no strict prescription for proposal format and submission, some general guidance is provided here. Certain divisions may have more specific instructions for submitting proposals.

Telephone inquiries to the appropriate point-of-contact are strongly encouraged before a formal proposal is submitted; short, informal proposals or letters of interest are also welcome. Queries or proposals should be directed to the point-of-contact who most closely matches the discipline as cited throughout this *Guide to Programs*.

At least one original plus two copies of a formal proposal should be submitted; the number of copies varies according to the needs of the reviewer(s). These proposals should be as self-contained as possible. Also, for grants, a correctly completed Certifications document (one has been provided for copying at the end of this section) is required. The following is a general outline for proposal submission.

PROPOSAL OUTLINE

1. Basic Information (to appear on a cover page)

a. Name and address of institution (indicate type, e.g., profit, nonprofit, educational, small business, minority-owned, women-owned, Historically Black College or University, minority institution, Federal Demonstration Project participant)

b. Title of proposal.

c. Statement that "This proposal is submitted pursuant to the Broad Agency Announcement, dated (specify most recent BAA date, e.g., 17 July 1995)." ONR's BAA is published annually in the *Commerce Business Daily* between June and July. Alternatively, cite the formal announcement specific to the program to which you are responding (e.g., cite the *Commerce Business Daily* announcement of the Young Investigator Program).

d. Funding requested from ONR.

e. Duration of effort.

f. Names and telephone numbers of the technical and business personnel who may be contacted for evaluation or negotiation purposes.

g. Dates of submission and signature(s) of official(s) authorized to obligate the institution contractually.

h. Identification of any proprietary information to be used by the Office of Naval Research for evaluation purposes only (the data which the offeror wishes to restrict shall be marked with a legend in accordance with Federal Acquisition Regulation 52.215-12).

2. Technical Information

a. Concise (approximately 200 words) abstract of the proposed effort.

b. Discussion of how the proposed research effort will respond to the objectives of ONR.

c. Outline of the scientific tasks to be performed and who will perform them, with approximate time, cost, and other information appropriate to each task.

d. Description (in sufficient detail to evaluate the proposal) of the scientific background, objective, and technical approach for each proposed task; appropriate references to the scientific literature should be cited.

e. Names of and brief biographical information on the key personnel.

f. Rationale for requested support of any facilities, equipment, or materials.

g. Description of general and special facilities available for performing the proposed work.

h. Pertinent bibliography of the investigators.

3. Cost Information

a. Proposed price or total estimated cost.

b. A cost estimate, broken down by year, for the proposed effort sufficiently detailed for meaningful evaluation; offerors shall provide supporting information on all items listed in the proposal budget.

4. Supporting Information

a. List of other research projects currently being undertaken by the principal investigator.

b. Extent of institutional participation and support for the program.

c. Names of other agencies receiving the proposal or currently supporting the effort.

d. Indication of how the proposed effort might be coordinated with Navy and industrial counterparts.

e. If animal subjects are to be used, guidance must be sought from the Director, Biological and Biomedical Sciences and Technology Division (Dr. Robert Newburgh, 703/696-4986); also, you may wish to see this guide's related section, "Special Information for Animal Experiments and for Human Experimentation."

PROPOSAL EVALUATION

Most proposals will be subjected to review against the criteria listed below. However, some divisions have more specific criteria, please check with the appropriate point-of-contact and also refer to the inside front cover for information on accessing information through ONR's Home Page.

Because Public Law 98-369 (Competition in Contracting Act) recognizes the validity of competitively selecting research proposals for award based on response to this *Guide to Programs*, proposal processing time will be shortened if the proposal transmittal letter or cover page indicates that the proposal is being submitted pursuant to the information provided here.

EVALUATION CRITERIA

1. Overall scientific, technical, or socioeconomic merits of the proposal. For awards made as contracts, the socioeconomic merits will include the extent of commitment in providing meaningful subcontracting opportunities for small business, small disadvantaged business, woman-owned small business concerns, and historically black colleges and universities and minority institutions.

2. Potential contributions of the effort to the agency's specific mission.

3. The offeror's capabilities, related experience, facilities, techniques, or unique combinations of these which are integral factors for achieving the proposal objectives.

4. The qualifications, capabilities, and experience of the proposed principal investigator, team leader, or key personnel who are critical in achieving the proposal objectives.

5. Realism of the proposed cost and availability of funds.

6. The extent to which the cost effectiveness of the proposed research is not diminished by expenditures for unproductive administrative and overhead expenses.

SPECIAL INFORMATION FOR ANIMAL EXPERIMENTS AND FOR HUMAN EXPERIMENTATION

Animal Experiments

The proposal must include:

1. The rationale for using the animal species involved, procedures to be used, and a discussion of pain causation, control, or prevention;

2. Evidence of contractor knowledge and capability to comply with established local and federal policy on use of animals; and

3. A plan for collecting and reporting animal-use data certified by an appropriate institutional committee on an annual basis. (Detailed guidance may be requested from the Director, Biological and Biomedical Sciences and Technology Division, or Director, Cognitive and Neural Sciences and Technology Division.)

Human Experimentation

1. Any proposal which involves the experimental use of human subjects must include a separate evaluation by the organization's committee for the protection of human subjects of proposed technical approaches and associated risks.

2. This evaluation must conform with current Department of the Navy instructions relating to the use of human subjects. (Detailed guidance may be requested from the Director, Cognitive and Neural Sciences and Technology Division.)

CERTIFICATIONS

Proposal Title____

____

Proposal Number and Date____

Certification Regarding Debarment, Suspension, and Other Responsibility Matters—Primary Covered Transactions

Instructions for Certification

1. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.

2. The inability of a person to provide the certification required below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such person from participation in this transaction.

3. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

4. The prospective primary participant shall provide immediate written notice to the department or agency to which this proposal is submitted if at any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

5. The terms *covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded,* as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is being submitted for assistance in obtaining a copy of those regulations.

6. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is proposed for debarment under 48 CFR part 9, subpart 9.4, debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

7. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion—Lower Tier Covered Transactions," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

8. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not proposed for debarment under 48 CFR part 9, subpart 9.4, debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.

9. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

10. Except for transactions authorized under paragraph 6 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is proposed for debarment under 48 CFR part 9, subpart 9.4, suspended debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

Certification Regarding Debarment, Suspension, and Other Responsibility Matters—Primary Covered Transactions

1. The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency;

b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 1b of this certification; and

d. Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

2. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Certification Regarding Drug-Free Workplace Requirements

Instructions for Certification

1. By signing and/or submitting this application or grant agreement, the grantee is providing the certification set out below.

2. The certification set out below is a material representation of fact upon which reliance is placed when the agency awards the grant. If it is later determined that the grantee knowingly rendered a false certification, or otherwise violates the requirements of the Drug-Free Workplace Act, the agency, in addition to any other remedies available to the Federal Government, may take action authorized under the Drug-Free Workplace Act.

3. For grantees other than individuals, Alternate I applies.

4. For grantees who are individuals, Alternate II applies.

5. Workplaces under grants, for grantees other than individuals, need not be identified on the certification. If known, they may be identified in the grant application. If the grantee does not identify the workplaces at the time of application, or upon award, if there is no application, the grantee must keep the identity of the workplace(s) on file in its office and make the information available for Federal inspection. Failure to identify all known workplaces constitutes a violation of the grantee's drug-free workplace requirements.

6. Workplace identifications must include the actual address of buildings (or parts of buildings) or other sites where work under the grant takes place. Categorical descriptions may be used (e.g., all vehicles of a mass transit authority or State highway department while in operation, State employees in each local unemployment office, performers in concert halls or radio studios).

7. If the workplace identified to the agency changes during the performance of the grant, the grantee shall inform the agency of the change(s), if it previously identified the workplaces in question (see paragraph 5).

8. Definitions of terms in the Nonprocurement Suspension and Debarment common rule and Drug-Free Work-

place common rule apply to this certification. Grantees' attention is called, in particular, to the following definitions from these rules:

Controlled substance means a controlled substance in schedules I through V of the Controlled Substances Act (21 U.S.C. 812), and as further defined by regulation (21 CFR 1308.11 through 1308.15);

Conviction means a finding of guilt (including a plea of *nolo contendere*) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the Federal or State criminal drug statutes;

Criminal drug statute means a Federal or non-Federal criminal statute involving the manufacture, distribution, dispensing, use, or possession of any controlled substance;

Employee means the employee of a grantee directly engaged in the performance of work under a grant, including: (i) all "direct charge" employees; (ii) all "indirect charge" employees unless their impact or involvement is insignificant to the performance of the grant; and (iii) temporary personnel and consultants who are directly engaged in the performance of work under the grant and who are on the grantee's payroll. This definition does not include workers not on the payroll of the grantee (e.g., volunteers, even if used to meet a matching requirement; consultants or independent contractors not on the grantee's payroll; or employees of subrecipients or subcontractors in covered workplaces).

Certification Regarding Drug-Free Workplace Requirements

Alternate I. (Grantees Other Than Individuals)

1. The grantee certifies that it will or will continue to provide a drug-free workplace by:

a. Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

b. Establishing an ongoing drug-free awareness program to inform employees about—

(1) The dangers of drug abuse in the workplace;

(2) The grantee's policy of maintaining a drug-free workplace;

(3) Available drug counseling, rehabilitation, and employee assistance programs; and

(4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace,

c. Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph a,

d. Notifying the employee in the statement required by paragraph a that, as a condition of employment under the grant, the employee will—

(1) Abide by the terms of the statement, and

(2) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;

e. Notifying the agency in writing, within ten calendar days after receiving notice under paragraph d(2) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer or other designee on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification number(s) of each affected grant;

f. Taking one of the following actions, within 30 calendar days of receiving notice under paragraph d(2), with respect to any employee who is so convicted—

(1) Taking appropriate personnel action against such employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or

(2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

g. Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs a, b, c, d, e and f.

2. The grantee may insert in the space provided below the site(s) for the performance of work done in connection with the specific grant:

Place of Performance (Street Address, City, County, State, Zip Code)

____

____

____

Check ☐ if there are workplaces on file that are not identified here.

Alternate II. (Grantees Who Are Individuals)

1. The grantee certifies that, as a condition of the grant, he or she will not engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in conducting any activity with the grant;

2. If convicted of a criminal drug offense resulting from a violation occurring during the conduct of any grant activity, he or she will report the conviction in writing, within 10 calendar days of the conviction, to every grant office or other designee, unless the Federal agency designates a central point for the receipt of such notices. When notice is made to such a central point, it shall include the identification number(s) of each affected grant.

Certification Regarding Lobbying Activities

The following certification applies only to actions exceeding $100,000:

Section 1352, Title 31, U.S.C. (PL 101-121, Section 319) entitled "Limitation on use of appropriated funds to influence certain Federal contracting and financial transactions."

1. No Federal appropriated funds have been paid or will be paid by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an Officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S.C. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Debt Certification

Is the proposed participant delinquent on any Federal debt?

Yes ☐ No ☐

(If the answer is "Yes," please attach explanation.)

Typed Name and Signature of the Person Responsible for this Transaction

Organization	Date

Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion—Lower Tier Covered Transactions

Instructions for Certification

1. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.
2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or termination.
3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
4. The terms *covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded,* as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
5. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is proposed for debarment under 48 CFR part 9, subpart 9.4, debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
6. The prospective lower tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion—Lower Tier Covered Transactions," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not proposed for debarment under 48 CFR part 9, subpart 9.4, debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.
8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
9. Except for transactions authorized under paragraph 6 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is proposed for debarment under 48 CFR part 9, subpart 9.4, suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion—Lower Tier Covered Transactions

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

ONR GENERAL GRANT TERMS AND CONDITIONS FOR EDUCATIONAL INSTITUTIONS, NONPROFIT ORGANIZATIONS, AND STATE AND LOCAL GOVERNMENTS

CLAUSES
(July 1995 Revised)

1. Federal Requirements
2. Order of Precedence
3. Administration and Cost Principles
4. Research Responsibility
5. Amendment of Grant
6. University Grantees
7. Principal Investigator
8. Publications
9. Acknowledgment of Sponsorship
10. Grantee-Acquired Property
11. Patent Rights
12. Rights in Technical Data and Computer Software
13. Human Subjects
14. Animal Welfare
15. Research Involving Recombinant DNA Molecules
16. Foreign Travel Approval
17. Activities Abroad
18. Nondiscrimination
19. Clean Air and Water
20. U.S. Flag Air Carriers
21. Security
22. Subawards and Contracts/Subcontracts
23. New Restrictions on Lobbying

1. Federal Requirements

This Grant is subject to the laws and regulations of the United States. If any statute expressly prescribes policies or specific requirements that differ from the requirements, standards, provisions, or terms and conditions of this Grant, the provisions of the statute shall govern.

2. Order of Precedence

Any inconsistency or conflict in the terms and conditions specified in this Grant shall be resolved according to the following order of precedence

a. The Federal statute authorizing this award, or any other Federal statutes directly affecting performance of this Grant.

b. These General Terms and Conditions.

c. Other terms and conditions contained within the Grant and any attached schedules.

3. Administration and Cost Principles

Applicable to this Grant, and incorporated herein by reference, are the requirements, standards, and provisions of the appropriate OMB Circulars and attachments thereto, as revised as of the effective date of this Grant, listed below. For purposes of this paragraph, the term "appropriate" is determined by the organizational nature of the Grantee (educational institution, nonprofit organization, state or local government).

a A-110, "Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals, and Other Nonprofit Organizations"

b A-21, "Cost Principles for Educational Institutions"

c A-122, "Cost Principles for Nonprofit Organizations"

d A-87, "Cost Principles for State and Local Governments"

e A-102, "Grants and Cooperative Agreements with State and Local Governments"

f A-88, "Indirect Cost Rates, Audit, and Audit Follow-up at Educational Institutions"

g A-133, "Audits of Institutions of Higher Learning and Other Nonprofit Institutions"

4. Research Responsibility

The Grantee has full responsibility for the conduct of the research activity supported by this Grant, in accordance with the Grantee's proposal, and the terms and conditions specified in this Grant.

Grantees are encouraged to suggest or propose to discontinue or modify unpromising lines of investigation or to explore interesting leads which may appear during the development of the research. However, they must consult the Program Officer through the Administrative Grants Officer before significantly deviating from the objectives or overall program of the research originally proposed.

5. Amendment of Grant

The only method by which this Grant can be amended is by a formal, written amendment signed by either the Grants Officer or the Administrative Grants Officer. No other communications, whether oral or in writing, are valid.

6. University Grantees

a. Prior Approvals

All prior approvals required by OMB Circulars A-21 and A-110 are waived hereby except for the following:

(1) Change of scope or objectives as required by the clause of these Terms and Conditions entitled "Research Responsibility."

(2) Change of key personnel as required by the clause of these Terms and Conditions entitled "Principal Investigator."

(3) Foreign travel as required by the clause of these Terms and Conditions entitled "Foreign Travel Approval."

(4) Extension of the expiration period of this Grant.

b. Preaward Costs

(1) Grantees may incur preaward costs of up to ninety (90) days prior to the effective date of the Grant award.

(2) Preaward costs as incurred by the Grantee must be necessary for the effective and economical conduct of the project, and the costs must be otherwise allowable in accordance with the appropriate cost principles.

(3) Any preaward costs are made at the Grantee's risk. The incurring of preaward costs by the Grantee does not impose any obligation on the Office of Naval Research in the absence of appropriations, if an award is not subsequently made, or if an award is made for a lesser amount than the Grantee expected.

c. Unexpended Balances

In the absence of any specific notice to the contrary, Grantees are authorized to carry forward unexpended balances of funds received to subsequent funding periods.

7. Principal Investigator

Support for the project may not continue without the active direction of the Principal Investigator (PI) approved for, and identified in, this Grant. If the approved PI (1) severs his or her connection with the Grantee or (2) otherwise relinquishes active direction of the project either permanently or for a significant length of time (three months or more), then the Grantee must either:

a. Appoint a replacement PI with the approval of the Program Officer, or

b. Relinquish the Grant, in which case the Grant shall be terminated in accordance with OMB Circular A-110, subpart C, paragraph 61, entitled "Termination."

8. Publications

Publication of results of the research project in appropriate professional journals is encouraged as an important method of recording and reporting scientific information. One copy of each paper planned for publication will be submitted to the Program Officer simultaneously with its submission for publication. Following publication, copies of published papers shall be submitted to the Program Officer.

9. Acknowledgment of Sponsorship

a. The Grantee agrees that in the release of information relating to this Grant, such release shall include a statement to the effect that the project or effort depicted was or is sponsored by the Department of the Navy, Office of Naval Research, and that the content of the information does not necessarily reflect the position or the policy of the Government, and no official endorsement should be inferred.

b. For the purpose of this clause, information includes news releases, articles, manuscripts, brochures, advertisements, still and motion pictures, speeches, trade association proceedings, symposia, etc.

c. Nothing in the foregoing shall affect compliance with the requirements of the clause of these Terms and Conditions entitled "Security."

10. Grantee-Acquired Property

Title to all nonexpendable and expendable tangible personal property purchased by the Grantee with grant funds shall be deemed to have vested in the Grantee upon purchase, unless stated otherwise in this Grant schedule, without further obligation to the Government.

11. Patent Rights

Patent rights are as specified in 37 CFR 401 entitled "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms under Government Grants, Contracts, and Cooperative Agreements." The "Standard patent rights clause" at 37 CFR 401.14 is modified at section (f) thereof to include the additional requirements stated in 37 CFR 401.5(f)(1), (2), and (3).

Invention disclosures are to be submitted to the Associate Counsel/Senior ONR Patent Attorney (Code 00CC1), Office of Naval Research, Department of the Navy, 800 North Quincy Street, Arlington, Virginia 22217-5660. That individual will represent the Administrative Grants Officer with regard to invention reporting matters arising under this Grant.

12. Rights in Technical Data and Computer Software

The Government will receive unlimited rights in all technical data and unrestricted rights in all computer software resulting directly from the performance of experimental, developmental, or research work which is specified as an element of performance under this Grant or any other Grant, contract or any subcontract made hereunder. Unlimited rights, as used in this clause, means rights to use, duplicate, release or disclose technical data or computer software in whole or in part, in any manner and for any purpose whatsoever, and to have or permit others to do so.

Such unlimited rights will apply unless the Grantee and the Grantor have negotiated in advance that the Government will receive, for a fixed period of time, less than unlimited rights in data or software generated under the Grant. At the end of such period, the Government shall regain unlimited rights in all Grant data. The Government shall have unlimited rights in any preexisting data furnished by the grantee unless an appropriate legend is affixed to the data by the Grantee limiting the Government's rights to such pre-Grant data or software. Cf. 48 Code of Federal Regulations 252.227-7013.

13. Human Subjects

Grant funds may NOT be used for research that uses uninformed or non-voluntary humans as experimental subjects. The Grantee is responsible for the protection of the rights and welfare of any human subjects involved in research, development, and related activities supported by this Grant. The Grantee agrees to comply, as appropriate, with the following directives and regulations (or their successors) which are incorporated into the Grant by reference:

a. DoD Directive 3216.2, "Protection of Human Subjects in DoD Supported Research," 7 January 1983, as amended.

b. DHHS Regulations, "Protection of Human Subjects" (45 Code of Federal Regulations, Part 46) of 18 & 28 June 1991, as amended; and,

c. FDA Regulations (21 Code of Federal Regulations, subchapters A, D, and H)

14. Animal Welfare

Any Grantee performing research on warm blooded vertebrate animals shall comply with the Laboratory Animal Welfare Act of 1966, as amended, (7 U.S.C. 2131 et seq.), and the regulations promulgated thereunder by the Secretary of Agriculture (9 CFR, Subchapter A, Parts 1 through 4) pertaining to the care, handling, and treatment of vertebrate animals held or used for research, teaching, or other activities supported by Federal awards. In addition, the Grantee shall comply with the provisions of DoD Directive 3216.1 as implemented by SECNAVINST 3900.38b, "The Use of Animals in DoD Programs," 1 June 1984. The Grantee shall specifically address paragraph 10 of SECNAVINST 3900.38B in reference to written assurance statements and clause 52.235-7002 of the DoD Federal Acquisition Regulations Supplement. The Grantee is also expected to ensure that the guidelines described in DHHS Publication No. (NIH) 85-23, "Guide for the Care and Use of Laboratory Animals," are followed and to comply with the "Government Principles for the Utilization and Care of Vertebrate Animals Used In Testing, Research, and Training" (included as an Appendix to the NIH Guide).

15. Research Involving Recombinant DNA Molecules

Any Grantee performing research involving recombinant DNA molecules and/or organisms and viruses containing recombinant DNA molecules agrees by acceptance of this award to comply with the National Institutes of Health "Guidelines for Research Involving Recombinant DNA Molecules," November 1984 (49 FR 46266-46291) or such later revision of those guidelines as may be published in the *Federal Register*

16. Foreign Travel Approval

Foreign travel requires liaison and advance approval. Grantee is cautioned that such advance approval could require 90 days in certain situations Grantee shall submit all foreign travel requests on NAVOCNR 4650/1 to the Administrative Grants Officer (AGO), unless the AGO provides specific instructions otherwise.

17. Activities Abroad

The Grantee shall assure that project activities carried on outside the United States are coordinated as necessary with appropriate Government authorities and that appropriate licenses, permits, or approvals are obtained prior to undertaking proposed activities The awarding agency does not assume responsibility for Grantee compliance with the laws and regulations of the country in which the activity(ies) is (are) to be conducted.

18. Nondiscrimination

Grantees shall comply with the provisions of the Civil Rights Act of 1964 (P.L. 88-352), as amended, and implementing regulations, and the Assurance of Compliance which the Grantee must have on file prior to award of a grant.

This award and any program assisted thereby are also subject to the provisions of Title IX of the Education Amendments of 1972 (P.L. 92-318, 20 U.S.C. 1681 et seq.), Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 794), the Age Discrimination Act of 1975 (P.L. 94-135), the implementing regulations issued pursuant thereto, and the Assurance of Compliance which the recipient has made available to the awarding agency.

The recipient shall obtain from each organization that applies to be, or serves as a subrecipient, contractor or subcontractor under this award (for other than the provision of commercially available supplies, materials, equipment, or general support services) an Assurance of Compliance as required by implementing regulations.

19. Clean Air and Water

If the amount of the Grant exceeds $100,000, the Grantee shall comply with the Clean Air Act (42 U.S.C. 1857), as amended; the Water Pollution Control Act (33 U.S.C. 1251), as amended; Executive Order No. 11738; and the related regulations of the Environmental Protection Agency (40 CFR, Part 15). Said regulations, Executive Orders, and Acts are incorporated into this Grant by reference.

20. U. S. Flag Air Carriers

This clause applies if the grant is over $50,000 and U S Government-financed international air transportation of personnel (and their personal effects) or property will occur in the performance of the grant. Under the Fly America Act, as codified at 49 U.S.C. 1517, grant funds may be used by grantees for air travel on non-U S flag air carriers only if service on a U.S. flag air carrier is not available. Regulations implementing the Fly America Act are found in the Federal Travel Regulations, specifically at 41 CFR 301-3.6(b). Guidelines implementing the Act have been issued periodically by the Comptroller General of the United States under Decision B-138942, most recently in the unpublished decision of 31 March 1981.

21. Security

The Grantee shall not be granted access to classified information under this Grant. If security restrictions should happen to apply to certain aspects of the proposed research, the Grantee will be so informed. In the event that the scientific work under this Grant may need classification, or involve access to or storage of any classified data, the Government shall make a decision on the need to classify, or require such access or storage within 30 days after receipt of a written notice from the Grantee. If the decision is affirmative, the Government shall invoke the clause in OMB Circular A-110, Subpart C, paragraph 61, entitled, "Termination."

22. Subawards and Contracts/Subcontracts

The applicable Federal cost principles for subawards and contracts/subcontracts under this Grant shall be those otherwise applicable to the type of organization receiving the subaward, contract or subcontract. In addition to OMB Circular A-21, the other applicable cost principles are:

a. OMB Circular A-122 applicable to other non-profit organizations, except those specifically exempted by the circular.

b. Subpart 31.2 of the Federal Acquisition Regulation (48 CFR 31.2) applicable to commercial firms and those nonprofit organizations specifically exempted from the provisions of OMB Circular A-122.

c. OMB Circular A-87 (34 CFR 255) for state and local governments

d. 45 CFR 74, Appendix E, for hospitals

23. New Restrictions on Lobbying

New Restrictions on Lobbying (32 CFR Part 28, July 1992) apply only if the total amount of the grant exceeds $100,000.00. In such cases, the lobbying regulations are incorporated herein by reference.

UNIVERSITY BUSINESS AFFAIRS

University Business Affairs (UBA) is responsible for establishing and maintaining effective business relationships between ONR and the university research community. The office carries out contract and grant administration, indirect cost rate negotiations, business system reviews and quality assurance responsibilities, primarily through ONR headquarters and five regional offices located in Atlanta, Boston, Chicago, San Diego and Seattle. UBA's scope extends to the administration of contracts and grants (with educational and nonprofit institutions) issued not only by ONR, but by DoD, the Army and Air Force, NASA, DoE, and other government organizations.

A major role for UBA is the development of DoD-wide policies, procedures and objectives associated with contract and grant administration and indirect cost rates at educational institutions. Also, the office has been credited with conducting the first testing, within the Department of the Navy, of electronic data interchange (EDI) and electronic funds transfer (EFT) for invoicing and payments under contracts and grants with educational institutions. This electronic payment method dramatically reduces paperwork requirements, improves cash management, and speeds payments to grantees and contractors.

When awards are made, regional offices are available to assist government and university business officials in contracts and grants administration. Regional office representatives, known as Administrative Contracting Officers (ACOs), conduct business on behalf of the federal government and provide oversight on certain aspects of grantee/contractor business operations. ACOs process payment requests, perform reviews of university business systems, assist in negotiating indirect cost rates at certain institutions, close out award documents, and provide general assistance and information on business matters.

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Below are lists of the five regional offices and three residencies currently transitioning functions that will be consolidated with the Regional and ONR Engineering Support Offices. For each regional office, the address and geographic area over which the office is cognizant is provided.

ALBUQUERQUE
Office of Naval Research
University of New Mexico
Bandelier Hall West
Albuquerque, NM 87131
505-277-3852
Fax: 505-277-3789

ATLANTA*
Office of Naval Research
101 Marietta Tower,
Suite 2805
101 Marietta Street
Atlanta, GA 30323-0008
404-730-9270
Fax: 404-730-9260

AUSTIN
Office of Naval Research
Room 582 - Federal Bldg
300 East 8th Street
Austin, TX 78701-3273
512-482-5532
Fax: 512-482-5529

BOSTON*
Office of Naval Research
495 Summer Street
Room 103
Boston, MA 02210-2109
617-753-4004
Fax: 617-753-4605

CHICAGO*
Office of Naval Research
Federal Building - Room 208
536 S. Clark Street
Chicago, IL 60605-1588
312-886-5423
Fax: 312-353-6089

NEW YORK
Office of Naval Research
33 Third Avenue
Lower Level
New York, NY 10003-9998
212-529-2330
Fax: 212-529-7252

SAN DIEGO*
Office of Naval Research
4520 Executive Drive
Suite 300
San Diego, CA 92121-3019
619-677-6460
Fax: 619-677-6480

SEATTLE*
Office of Naval Research
1107 NE 45th Street
Suite 350
Seattle, WA 98105-4631
206-526-3168
Fax: 206-526-3210

* These offices can be accessed through the internet

Cognizance by State

States	Regional Office	States	Regional Office
Alabama	ATLANTA	Nebraska	SAN DIEGO
Alaska	SEATTLE	Nevada	SEATTLE
Arizona	SAN DIEGO	New Hampshire	BOSTON
Arkansas	ATLANTA	New Jersey	BOSTON
California	SAN DIEGO, SEATTLE	New Mexico	SAN DIEGO
Colorado	SEATTLE	New York	BOSTON
Connecticut	BOSTON	North Carolina	ATLANTA
Delaware	ATLANTA	North Dakota	SEATTLE
District of Columbia	ATLANTA	Ohio	CHICAGO
Florida	ATLANTA	Oklahoma	SAN DIEGO
Georgia	ATLANTA	Oregon	SEATTLE
Hawaii	SEATTLE	Pennsylvania	CHICAGO
Idaho	SEATTLE	Rhode Island	BOSTON
Illinois	CHICAGO	South Carolina	ATLANTA
Indiana	CHICAGO	South Dakota	SEATTLE
Iowa	CHICAGO	Tennessee	ATLANTA
Kansas	SAN DIEGO	Texas	SAN DIEGO
Kentucky	CHICAGO	Utah	SEATTLE
Louisiana	ATLANTA	Vermont	BOSTON
Maine	BOSTON	Virginia	ATLANTA
Maryland	ATLANTA	Washington	SEATTLE
Massachusetts	BOSTON	West Virginia	CHICAGO
Michigan	CHICAGO	Wisconsin	CHICAGO
Minnesota	CHICAGO	Wyoming	SEATTLE
Mississippi	ATLANTA	Canada	SEATTLE
Missouri	CHICAGO	Foreign Countries (Not Canada)	BOSTON
Montana	SEATTLE	Puerto Rico	NEW YORK

OFFICE OF SMALL BUSINESS

The Office of Small Business is a small business advocacy and advisory office responsible for insuring that small business, woman-owned small business, and small disadvantaged business concerns, including historically black colleges and universities and minority institutions (HBCU/MIs), participate in ONR's acquisition program both as prime contractors and as subcontractors. The office maintains an active outreach program to identify potential small business program participants by attending and participating in government-industry conferences throughout the United States. In addition, the office provides individual and group procurement advisory counseling to the small business community. Procurement advisory counseling includes advice concerning acquisition procedures, information regarding proposed acquisitions, instructions on preparing proposals, interpretation of standard clauses, certifications and representations, obtaining payment, and obtaining financial assistance within the procurement regulations.

A major role in the implementation of the Small Business Program at ONR involves advising and assisting contracting officials and program managers in acquisition planning and reviewing all acquisitions for possible small business program set-asides and subcontracting opportunities. The office provides assistance to ONR's contracting officials regarding the determination of the acceptability of prime contractor subcontracting arrangements.

The office monitors and comments on proposed small business legislation in addition to developing and implementing procurement policies and procedures to assist small firms in their quest to further their participation in ONR's acquisition programs, including the Small Business Innovation Research Program and the Small Business Technology Transfer Program

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Index

A

Adaptive Control 30
Adaptive Neural Systems 29
Aircraft Technology 32
Airframe Materials 17
Algal Biotechnology 26
Amphibious Logistics and Facilities Repair Technology 21
Antennas and Propagation 8
Applied Analysis 5
Artificial Intelligence 6
Atmospheric Modeling and Prediction 10
Atomic and Molecular Physics 19
Augmentation Awards for Science and Engineering Research Training of the URI 35
Aviation Medicine and Human Performance Research 27

B

Best Manufacturing Practices Center of Excellence 48
Biocatalysis 25
Biocorrosion 25
Biodeterioration 24
Biofabrication 25
Biofouling 24
Biological Sonars 26
Biological/Chemical Oceanography 10
Bioluminescence 26
Biomaterials 25
Biomimetics 25
Biomolecular Recognition 25
Biosensors 25
Biosonar 30

C

Cast Ductile Iron 47
Cell Biology of Trauma 27
Center of Excellence for Composites Manufacturing Technology 48
Certifications 57
Circuits and Systems 7
Coastal Dynamics 12
Coatings, Corrosion, and Oxidation 15
Cognitive Science 30
Combat Casualty Care 27
Combinatorial Synthesis 25
Command and Control 6
Communications 7
Computational Mechanics 22
Computer Systems and Technology 6
Condition-Based Monitoring and Life Prediction 16
Contracts 52
Control of Dynamic Systems 22
Control of Electric Power Systems 22
Cooperative Engagement Capability: Transmit and Receive Modules 47
Cooperative Research and Development Agreements 49

D

Decision Making 28
Defense University Research Instrumentation Program of the URI 42
Discrete Mathematics 6
Diving and Submarine and Special Operations Medical Research Program 27
DoD Experimental Program to Stimulate Competitive Research of the URI 43
DoD National Defense Science and Engineering Graduate Fellowship Program of the URI 33
Domestic Technology Transfer Program 50

E

Electro-optics Technology 4
Electrochemical Science and Technology 19
Electromagnetic Transparencies 16
Electronic and Electro-optical Materials 3
Electronic Combat 8
Electronic Materials 3
Electronic Packaging and Thermal Management Materials 16
Electronics Manufacturing Productivity Facility 47
Energetic Materials 18
Energetics Materials Technology Center (Explosives and Propellants) 48
Environmental Biotechnology 26
Environmental and Occupational Medicine Program 27
Environmental Optics 9
Environmental Quality 20

F

Faculty Sabbatical Leave Program 41
Fiber-Optic Acoustic Sensors 47
Foreign Field Offices 45
Free-Surface and Two-Phase Flows 18

G

General Grant Terms and Conditions 63
Grants 52
Gulf Coast Region Maritime Technology Center 48

H

High Latitude Dynamics 11
High School Apprenticeship Program 36
High Temperature Superconducting Ceramic Materials 17
How To Submit a Proposal 54
Human-System Interface 28
Hybrid Learning 31
Hybrid Neural Systems 29

I

Image Analysis 30
Immunophysiology 28
Intelligent, Computer-Aided Instruction 31
Inventions and Patents 52
Ionosphere Modification 5

J

Joint Services Electronics Program 5

L

Lasers and Electro-optics 20
Life-Cycle In-Service Repair Network 48
Legged Locomotion 29
Logistics Technologies 21
Low Frequency Sound 26

M

Magnetic Materials 17
Manufacturing Science and Advanced Materials Processing Institute 49
Manufacturing Systems Development 48
Marine Biology 26
Marine Geology and Geophysics 11
Marine Mammal Physiology and Locomotion 26
Marine Meteorology 11
Marine Sediments 26
Material Processing Science and Technology 16
Materials and Processes for Life Extension, Reliability, and Affordable Processing 15
Materials and Processes for Survivability, Situational Awareness and Weapons Delivery 16
Mechanics of Metals 21
Microelectronics 4
Missile and Spacecraft Materials and Propulsion Materials 17
Molecular Biology of Marine Organisms 26
Multidisciplinary Research Program of the URI 42

N

Nanoscale Electronics 4
National Center for Advanced Drive Train Manufacturing 49
National Center for Excellence in Metalworking Technology 48
Naval High School Science Awards Program 35
Navy Laser Center 49
Navy SBIR Technology Transfer Program 51
Navy Science and Technical Information Program 50
Navy Small Business Technology Transfer Pilot Program 50
Neural Computation 29
Neuro-Cognitive Science 31
Neuromorphic Systems 30
Nondestructive Evaluation/Inspection 16
Nonlinear Dynamics 20
Nonlinear Neural Dynamics 29
Numerical Analysis 5

O

Ocean Acoustics 12
Ocean Engineering and Marine Systems 13
Ocean Modeling and Prediction 10
Office of Small Business 70
ONR Historically Black Colleges and Universities Graduate Fellowship Program 34
ONR Historically Black Engineering Colleges Future Faculty Fellowship Program 39
ONR Postdoctoral Fellowship Program 37
ONR SBIR Program 51
ONR Science and Technology Historically Black Colleges and Universities and Minority Institutions Council 44
Operations Research 7
Optoelectronics 4
Organic and Organometallic Chemistry 20
Organizational Design 28

P

Personnel Readiness 29
Physical Acoustics 20
Physical Chemistry 19
Physical Oceanography 9
Piezoelectric and Electrostrictive Materials 17

Plasma Physics 20
Polymer Chemistry 19
Probability and Statistics 5
Propulsion 18
Propulsors and Flow Structure Interactions 18

R

Reports Policy 53
Research Facilities 14
RF Solid State Devices 4
Robotics 6

S

Scientific Visualization 6
Semiconductor Devices 4
Sensing--Information Dominance 12
Sensor Processing 8
Sensors, Sources, and Arrays 13
Ship Maneuvering and Seakeeping 23
Ship Power and Automation 22
Ship Signature Control 23
Ship Structural Systems 22
Ship, Submarine, and Hydrospace Materials 17
Shipboard Waste Effluents 26
Shore Facilities Materials 18
Signal Analysis 8
Small Business Innovation Research Program 50
Software 6
Solid Mechanics of Composites 21
Solid State and Surface Chemistry 19
Space and Remote Sensing 12
Special Information for Animal Experiments and for Human Experimentation 55
Spatial Orientation and Navigation in Large-Scale Virtual Spaces 31
Strike Technology 32
Structural Acoustics and Structural Dynamics 22
Structural and Propulsion Materials 17
Submarine Maneuvering and Seakeeping 23
Submarine Power and Automation 23
Submarine Signature Control 23
Submarine Structural Systems 23
Summer Faculty Research Program 40
Superconducting Electronics 4
Surface Engineering 49
Surface/Aerospace Surveillance 7
Surfaces and Interfaces 3
Systems and Communication Theory 8

T

Tactical Environmental Support 11
Tactical Sensing Support 13
Tribology and Adhesion Science and Technology 16
Turbulence 18

U

Undersea Signal Processing 13
Undersea Weapons Technology 18
University Business Affairs 68
University Research Initiative Support Program 43

V

Vacuum Electronics 4
Virtual Environments for Training 28
Virtual Environment Training Technologies 31

W

Weapons Technology 32
Women Postdoctoral Science Scholars Program 38

Y

Young Investigator Program 38